GAS JOURNAL, FEB. 2, 1938

VOL. 221. 90th YEAR. No. 3898.

Editorial Notes

The Cooking Load

IN last week's "JOURNAL" we discussed the problem of load building in general terms, pointing out that to counter electrical competition it is necessary for us to persuade consumers to install as many modern appliances as possible for all the varied domestic requirements. We have to afford long-term hire-purchase at rates about equivalent to those fixed for simple hire, and we have to provide the organization necessary to ensure that the appliances installed in consumers' premises are maintained in a condition such as to give the best service at all times. Bearing in mind the limited incomes of the vast majority of gas consumers, we suggested that the gas appliances put out on hire-purchase terms will not be fully used—in other words, the consumer will not obtain the proper measure of satisfaction from them—unless gas is supplied at a cheap rate; and gas can never be supplied cheaply if it is called upon to bear any substantial portion of the cost of appliances and the cost of their fixing and servicing. We advanced the view that the only way to increased gas consumption is to afford consumers the best possible facilities for the acquisition of appliances, sell these appliances with an eye not on their immediate sale but on their ultimate use, and, above all, adopt some form of two-part tariff which will enable the consumer to substitute solid fuel by gas without incurring an all-in fuel bill greater than formerly, or, at any rate, if it does exceed that sum, a bill of an amount which the consumer is willing and able to pay for the added convenience and labour-saving of gaseous fuel.

In the same issue of the "JOURNAL" we called attention to the launching by the British Commercial Gas Association of a National Cooker Fortnight for the end of February, urging all gas undertakings to lend their fullest support to this campaign. There are still, unfortunately, undertakings content to sit back and to regard the cooking load as safe. No load whatever is safe, however, as long as out-of-date appliances remain on the district and electrical competition continues. Wherever the gas cooking load which was sold many years ago has fallen into disrepute through lack of proper attention, it must be sold again. Old and ugly appliances are still doing so-called service in many districts; these appliances are a joy to the electrical salesman and a menace to the retention of the gas cooking load. The object of such campaigns as the Cooker Fortnight is to replace them with modern equipment.

It may serve a useful purpose if for a moment we turn from the general to the particular and look more closely into the type of electrical competition we are, or shall be, called upon to counter; and in this connexion a Paper which was presented at a recent meeting of the Institution of Electrical Engineers is of more than a little interest. This Paper was concerned with electric cookers for domestic purposes; it was by Mr. J. N. Waite, Electrical Engineer to the Hull Corporation. "For a great many years now," said Mr. Waite, who urged all electricity undertakings to have no qualms as to the ultimate economic value of the cooking load, and to concentrate on its development, "there has been growing the conviction that electricity is, or can be made, a great social service which can be organized so as to provide valuable assistance for all sections of the community. All schools of political thought are subscribing more and more to this ideal. Thus electricity supply is coming to be regarded as something more than a business." We have no quarrel with the idea of electricity as a social service, but if the development of that service is at the expense of a far greater social service as far as the nation's heat requirements are concerned, the community and the electricity industry itself are bound to suffer.

Off-Peak Current

THE national aspect of the whole problem was clarified in the statesmanlike Address which Sir David Milne-Watson gave at the Conference of the British Commercial Gas Association in Manchester last autumn. This was referred to fully in these columns at the time, but it will not come amiss if we refresh our memories with some of the salient facts brought out in that Address. What, asked Sir David, would be the effect of the policy of the electricity industry, assuming that it could be carried to its logical conclusion in a successful invasion by electricity of the whole field of domestic fuel provision now occupied by the Gas Industry? He referred first to the question of magnitude, remarking that to meet the Sunday cooking load of the London gas companies alone would require twenty electric power stations the size of the monster one at Battersea; it would, in fact, require two and a half times the total installed capacity of generating stations serving the Metropolitan area. Taking a figure of £60 capital expenditure per kilowatt installed, such an expansion would need £300,000,000. A figure for the whole country would not be less than five times as great. Again, electricity is sold for heating and cooking at a halfpenny or so a unit because it is an off-peak load. What would become of this price when the heating load soared? Is the public, Sir David asked, to

subscribe millions of pounds for electrical construction, and then find that the current costs three or four times as much?

In regard to this question of load factor, Mr. Waite, in the Paper to which we have referred, advanced the argument that if a number of electric appliances are installed, then such is the diversity of use that over a large number of houses so equipped the load factor may be relatively high due to the different habits of householders. To an extent this may be true, but it is obvious that the peak would be colossal if electricity were ever to replace gas for domestic cooking. The few electric cookers installed do not affect the peak, and current for cooking can at the moment be supplied at off-peak rates, being, in fact, subsidized by the premium rates charged for lighting. A slant on the matter of peak load is given by some figures put forward by Mr. Waite for a housing estate occupied by workers whose purchasing power is low. This, we presume, would be called an "all-electric" estate. In fact, a multi-purpose coal fire is provided, and consumption figures show that cooking is carried out by coal in the winter and on the electric cooker in the summer. Such a load naturally does not add to the peak, but the consumption figures are hardly a high testimony to the much vaunted "all-electric" service which Mr. Waite wants to see complete at a cost which is within the reach of all.

The electrical interests at Hull have certainly striven hard to gain the cooker load, and, on the face of it, with a measure of success. Doubtless they have been helped by the appeal of fashion, and what success they have met with may be short-lived. It is interesting to see what has been done in Hull during the past few years, and the way in which the Electricity Department has set about to capture the cooking load. First of all Mr. Waite decided, to keep the hire charge as low as possible, to offer one type of cooker only and that only in four sizes; and in this connexion there is an interesting comment in his Paper to the effect that an efficient cooker manufacturer has a far better knowledge of the requirements of a cooker than any supply engineer can hope to find time to obtain. His point was—and it is a good one applicable to the Gas Industry—that purchasers should refrain from specifying details differing from a manufacturer's standard production. We could say much on this question, but that is not the purpose of this note. Then he concentrated hard on his two-part tariff—a minimum charge of £3 a year and current at ½d. a unit for the first 360 units a quarter, with a charge of ¼d. a unit for all in excess. With gas sold on a flat rate, we think it will be agreed that ¼d. per unit of electricity represents competition.

To and Fro

WE have called attention once again to the broad statements made by Sir David Milne-Watson last autumn that a complete change-over from gas to electric cooking would prove disastrous economically to the consumer and to the community. This statement, factual as it is, should not blind any gas undertaking into the idea that the cooking load is "safe." Almost incredible as it may seem, we have heard of cases where Sir David's figures have been used as a justification for a policy of doing exactly nothing. Needless to say, such a policy of *laissez-faire* is fraught with the gravest danger. As we have said, on the appeal of fashion, and with what amounts to a subsidy, electrical inroads can be, and are being, made. By re-selling the gas cooking load we must ensure that these inroads are but temporary. Let us examine the results at Hull as outlined by Mr. Waite in his Paper. In less than eight years, he said, 15,538 electric cookers have been placed in service, and 85% of these are in working-class houses. As far as we can ascertain there are about 62,000 gas cookers installed at Hull, and the number of gas consumers is in the neighbourhood of 90,000. The electrical encroachment, therefore, cannot be lightly dismissed as being negligible. Let us, however, subject the figures given by Mr. Waite to closer scrutiny, and see whether we can find cause for encouragement in the campaign we must ever vigilantly wage to capitalize the advantages which gas undoubtedly holds over electricity, and to re-sell the gas cooking load wherever this may be necessary.

The period covered by Mr. Waite is from the year 1929 to the end of 1937. We find that in 1933 the number of electric cookers installed was 6,592. The figure given for 1934 is 7,406—an increase of 814. In the same twelve months no fewer than 1,150 electric cookers were removed from the district. Not much of a gain that year. Taking the period 1931-37 we find also that 5,689 cookers were removed, which hardly spells the consumer's satisfaction with or ardent advocacy of electric cooking, however persuasive or coercive the measures may have been which resulted in the initial installation. At the end of 1934, the number of electric cookers in use in the Hull area was 7,406. At that time 2,581 was the figure for "removals." And now let us turn to the question of maintaining these electric cookers. In 1936, 12,010 cookers were in use, or at any rate in partial use. In that year there were no fewer than 12,023 "faults" which had to be attended to. For this service, Mr. Waite stated, with, we suggest, a little misplaced pride, that "throughout the week, including Saturdays and Sundays, trained men are on duty from 8 a.m. to 11 p.m. to attend solely to cooker faults." And the costs of this maintenance service? The cost per cooker in 1936 was 15s. 3d., in 1937 it was 13s. 5d. We suggest that the average of 14s. 1d. per annum per cooker over the two-year period represents somewhat expensive teething trouble.

The Question of Speed

WHAT accounts for that formidable total of 5,689 electric cookers removed from service? In his Paper, Mr. Waite referred to the "alleged" shortcomings of electric boiling plates. "The critics of the boiling plate," he said, "are evidently not students of human nature." And he went on to remark that in the days when the coal fire was the only means of cooking, the householder had to adjust his habits to the known limitations of a coal fire, and did so. "When gas cookers became available, the habits of the householder changed to accommodate themselves to its possibilities. Once people have become accustomed to the possibilities of an electric cooker, their habits adapt themselves to its possibilities." "The housewife," he said, "will adjust her habits to the means at her disposal, and, having done so, will forget all about quick boiling." This form of special pleading will, we are sure, interest the housewives in Hull who enjoy the amenities of electric cooking, and of whom, we are told, 85% represent the working-class. Will it interest their husbands? It occurs to us that there may be occasion when a working-class husband desires, perhaps, a cup of tea in the early morning before going to work and does not wish to awaken a tired wife. Will he be full of delight when gradually, very gradually, the temperature of the water in the kettle over the electric hotplate rises?

"Rural Gas Service" was the title of a Paper read by Mr. A. G. Holtam, of the Cheltenham and District Gas Company,

at a recent meeting of the Western Junior Gas Association. The Paper has significance in view of the foregoing remarks Into country districts introduced some years ago to electricity, and in which the only competition that electricity knew was from oil and solid fuel, the Severn Valley Gas Corporation extended their mains. Adequate facilities were afforded to gas consumers to acquire modern cooking equipment—and the result, we now quote from Mr. Holtam's Paper, is to "enable us to obtain immediately practically the whole of the cooking load from electricity and readily make substantial sales of cookers to households previously using solid fuel or oil. . . . A major consideration has been speed, especially of the hotplate. Speed is a convenience for which consumers are prepared to pay. It will bring the hotplate into use even when solid fuel fires are available at no extra cost." In certain of the rural districts serviced by the Severn Valley Gas Corporation the gas cooking load is being sold for the first time. It is being sold in competition with electricity and with success. In most areas the gas cooking load was sold years ago. We suggest that where it needs re-selling, the B.C.G.A. Gas Cooker Fortnight may be found a convenient base from which to launch intensive operations.

The Conjoint Conference

On later pages of this issue of the "Journal" we publish the Annual Report of the Conjoint Conference of Public Utility Associations. The Conjoint Conference, though starting from small beginnings, is rapidly assuming a dominant position among the Central Associations. At the time when the Conference was formed there must have been many who doubted whether there could be any co-operation between the competitive industries of gas and electricity, or between these industries and the non-competitive interests of water. It was soon discovered, however, that, although in matters directly affecting the sale of its commodity each industry must act independently, there existed a vast range of matters in which the interests of each of the three industries was identical. The number of matters with which the Conjoint Conference can properly deal extends year by year, and the Report submitted this year is some indication of the success which has been achieved. In the field of private and public legislation, public utilities have been able to speak with one voice, and to-day it has become recognized that the privileged position formerly accorded only to Railway Companies must be extended to gas, water, and electricity undertakers.

It cannot be doubted that the existence of the Conference has greatly facilitated the work of Government Departments, which are now able to deal with matters affecting public utilities in one series of negotiations, and where some pressure is necessary the combined weight of every public utility association in Great Britain is, for obvious reasons, more effective than could be their independent action. That in the realms of taxation the Conjoint Conference has not been idle is sufficiently indicated by the complete exemption, not only of statutory public utilities, but also of holding companies controlling such utilities, from the National Defence Contribution; further, as we indicate later, the views of the Conference on rating reform have spread to other influential circles. If there is, as yet, no satisfactory solution of the problem of mains and cables in highways, it would be impossible to lay the blame at the door of the Conference, and it is excellent to know that through the medium of the Conference the views of public utilities will be presented to the Governmental Committee which has been appointed to deal with this matter.

Important as such subjects are, it could scarcely be denied that the greatest achievement of the Conference during the year has been the co-ordination and representation of the view of all public utilities throughout the country in regard to the Coal Mines Act. It is unthinkable that in this matter gas, electricity, and water could have trodden distinct paths; yet, had the Conference not existed, there would have been no organization through which these three great industries could have co-operated. It is necessary for us from time to time to sound the battle cry of the Gas Industry in its competition with electricity. From competition, given a fair field and no favour, we hold that nothing but good can result; it is the forcing ground of enterprise and initiative. It is, however, a pleasure to be able to bear witness to the many ways in which competition is laid aside in favour of the co-operation which has been productive of so many excellent results. Not the least of such results are greater understanding and friendship between those where united concern should be to serve the great British public with the primary requisites of modern life. We would congratulate the Conference in securing for another year the services of Lord Mount Temple as President, and as Vice-Presidents such well-known public men as Viscount Falmouth, Sir David Milne-Watson, and Mr. William Cash.

Rating

The third new Valuation List under the Rating and Valuation Act, 1925, is due to come into force in most areas throughout England and Wales on April 1, 1939. Already there are many signs of activity on the part of rating authorities, and there can be no doubt that before this year is out the majority of gas undertakers will be involved in the many vexations and complexities which appear to be the necessary corollary to rating assessments.

It is greatly to be regretted that the more glaring anomalies affecting rating procedure could not have been rectified before the third quinquennial valuation. These anomalies are due, to some extent, to force of circumstances. When the Rating and Valuation Act was originally introduced into Parliament as a Bill it contained special provisions dealing with the assessment of public utilities, but owing to pressure on Parliamentary time these provisions were subsequently struck out of the Bill. A vague promise was given by the Government that the assessment of these special properties should be the subject of subsequent legislation. To date this promise has been redeemed only in the case of the railway companies and there does not appear to be any disposition on the part of the Government to introduce any measure dealing with rating.

Public utilities are therefore forced to attempt to fit themselves into an Act in a form which was not originally intended to apply to them, and to co-operate in a procedure peculiarly unsuited to their requirements. To mention only two matters, Assessment Committees where jurisdiction extends only to the boundary of some minor local government district can hardly hope to assess a public utility undertaking whose distribution systems may cover vast tracts of territory extending into many counties. Even the co-operation of the County Assessment Committee is often inadequate to secure that an undertaking extending into several counties is assessed as one entity. Secondly, no real satisfaction can be obtained from appeals to Quarter Sessions, which are presided over by gentlemen who are frequently, and not unnaturally, unfamiliar with the

method of assessing public utilities "on the basis of profits." Such a Tribunal naturally prefers the easy course of securing some rough and ready settlement on figures rather than make any pronouncement of some important and vital question of principle.

It is well known that the Conjoint Conference had on more than one occasion directed the attention of the Central Valuation Committee to these and similar difficulties. It is not known how far that body or the Government are willing to assist in rectifying a very real grievance. It is, however, extremely gratifying to know that the views which have so frequently been expressed by public utilities are in substance, if not in detail, endorsed by the Chartered Surveyors' Institution and Rating Surveyors' Association. These bodies have produced a Memorandum advocating the abolition of the appellate jurisdiction of Quarter Sessions in rating matters. The Memorandum, while retaining unmodified the existing practice of primary assessment by Assessment Committees, suggests that the appeal from these Committees should be to an arbitrator and not to Quarter Sessions. The Memorandum states that this suggestion might lead to a mitigation of the difficulties at present connected with the assessment of public utilities. Such a Memorandum, coming from the professional valuers of the country, should add immense weight to the contentions already put forward by the Conjoint Conference. Public utility undertakers are usually among the larger ratepayers of their area and throughout the county contribute several millions of pounds annually to the rates. Further, these organizations have been denied any de-rating relief. After long consideration they have unanimously decided that fair play cannot be obtained under the existing system, and their disapproval of that system has been endorsed by the Associations of those whose profession it is to deal with these matters. Surely such a case is strong enough to merit the most serious consideration of the Government.

A.R.P. and Public Lighting

In other pages of this issue we give the story of the experimental black-out at Leicester last week, as it was seen by a "JOURNAL" observer on the spot. If the experience of the Gas Department on that occasion is helpful as a guide to others whose plans are still merely under consideration, a useful purpose will have been served. Mr. James Mitchell, for all his excellent work, would be the last to claim that perfection has been achieved. In fact, unfortunately A.R.P. in this country is still very much in a state of experimentation and exploration.

It is necessary to bear this in mind in considering a Memorandum dated Jan. 28, 1938, which the Home Office has circulated to Local Authorities, dealing with the Air Raid Precautions Act, 1937, and, *inter alia*, suggesting that Local Authorities should proceed with the preparation of A.R.P. schemes on the basis of certain draft regulations enclosed with the Memorandum. These draft regulations include "arrangements for or in connexion with the restriction and regulation of lighting in highways, streets, and public places."

It is important to note that the A.R.P. Department of the Home Office has not yet made any promulgation of policy and requirements in the matter of such restriction and regulation of public lighting in connexion with A.R.P. Until such promulgation is made officially by the Home Office, any A.R.P. schemes drawn up by Local Authorities in respect of public lighting can only be based upon surmise as to what may eventually be the national policy in this matter; they might, in fact, have to be completely re-cast when such policy is promulgated.

We understand that The Institution of Gas Engineers is in close touch with the A.R.P. Department of the Home Office in this matter and we feel sure that, in case of any difficulty which may arise, gas undertakings cannot do better than ask for advice at Gas Industry House, where the position is fully understood.

Gas Companies and Publicity

Many people will doubtless feel that Mr. S. W. Alexander was thinking rather far ahead, when contending a few days ago in the financial columns of the *Evening Standard* that "companies should open their meetings for public enlightenment. Anybody should be permitted to go into a company meeting on the payment of a small fee, and providing that they have a label attached to them, so that they do not vote on the resolutions. Thus they would be able to look and listen before investing their money." But though this may be an extreme view, the idea that potential investors may get guidance from the proceedings at company meetings, and that facilities should be provided them for doing so, is a sound one. It must be remembered, however, that in these days most large companies take steps to have the proceedings at their meetings published, so that would-be investors, as well as shareholders, are enabled to follow the fortunes of the undertakings. Such guidance will be found in abundance in the columns of the "JOURNAL" during the next few weeks, when we shall be printing full reports of the meetings of a number of the more important Gas Companies. These reports will perform a valuable public service if they induce many more small investors to seek the safety of the Gas Industry for their savings. On the whole, we prefer to regard the Chairmen of these meetings as doing good work in that way, rather than have to assess the value of their "box office appeal" among persons anxious to attend company meetings "on the payment of a small fee," and with "a label attached to them."

Work at Leeds University

We are glad to note from the Report of Professor J. W. Cobb to the Coal Gas and Fuel Industries Committee that the scope of the work of the Fuel Department of Leeds University is widening in many directions, and it would seem that its activities are likely still further to be extended in the near future. The number of students undergoing training has increased, and apart from the larger volume of research work carried out by students and staff the line of advance of the Joint Research Committee of The Institution of Gas Engineers and the University is tending towards more work within the University. Then, with the financial support of the Alloy Steels Research Committee of the Iron and Steel Institute, investigations into the influence of furnace atmospheres on metals have been extended. The problem is under consideration of including in the Gas Engineering Course a fuller training in chemical engineering; and if the University sets out to meet this need, and we think it is a real one, the part which the Fuel Department will presumably be called upon to play will demand more room in which to play it. With the developments which have taken place in the Department's work the available accommodation is only just sufficient to meet present needs. Professor Cobb's Report, an extract from which appears on a later page, makes encouraging reading. The increase in the number of students may in part be due to the general improvement in industry, but it must arise also from a realization outside and inside the various industries of the extent to which future success is going to depend on the activities of a scientifically trained personnel. Men trained at Leeds have in no small measure contributed to the Gas Industry's progress, and it is good to realize that more and more young men are taking advantage of the specialized educational facilities provided by the Fuel Department of Leeds University.

Thin Tar Carpets

A great deal of experimental work has been carried out recently on thin tar carpets; and fresh in the minds of our readers will be the report on the subject which the South Metropolitan Gas Company published last year. We were enabled to reproduce a considerable portion of that report in the "JOURNAL" of Sept. 15, 1937. It has been amply demonstrated that in this new development, as in other branches of road construction and surfacing, tar can maintain its position as an important modern road binder. As the forerunner of all modern road-making materials, tar continues to prove its adaptability for meeting the changing conditions of highway transportation. Last Thursday, in a Paper presented at a meeting of the West of England Branch of the Institute of Quarrying, Mr. W. E. Cone, Technical Adviser to the British Road Tar Association, dealt in a general way with the problems connected with the manufacture and laying of these thin tar carpets, and brought to the notice of his audience specifications agreed upon by the B.R.T.A. for "coarse," "medium,"

and "fine" carpets, these specifications having been based on the successful results obtained from each type over a number of years. The success of tar for roads depends upon its correct application, and we hope the importance will be realized of adhering to specifications which are the outcome of both laboratory experience and long practical trial. We publish on later pages the B.R.T.A. specifications for thin tar carpets.

Welding of Gasholders

In a Paper on the choice of gas storage read at a meeting of the Yorkshire Junior Gas Association, Mr. W. S. Hubbard, of the Leeds Gas Department, referred to the question of constructing gasholders by welding as distinct from riveting. He spoke of the slow progress which has been made in this country in the fabrication of holders by welding, and suggested that it might partly be accounted for by the relatively small amount of information and data on welding compared with the wealth of information and experience gained in connection with riveted structures. Then again, of course, in welding much depends on the personal element, the skill and conscientiousness of the welder. There is, however, an all-welded holder of the piston type nearing completion at the Dagenham Works of the Ford Motor Company. This holder, which has a capacity of 2 million cu.ft. and is of the Klönne type, was illustrated in the "JOURNAL" of Oct. 27 last. Mr. Hubbard put forward the view that there are many parts and places on a riveted gasholder that would be improved if constructed by welding. For example, he said, holder carriages are bolted through the curb sheets or dip channels, and would be far better if mounted on baseplates welded to these places so that the bolts could be taken out and carriages removed and replaced if necessary. The bottom plating of any tank, he suggested, would be far better welded than riveted and would leave less doubt as to leakage after the bottom had been lowered; inlet and outlet pipes if welded at site would lessen the dangers of leakage; and at all places where it has been the custom to have bolts that are removable only when the holder is out of commission, and where a welded alternative can be arranged, this should be carried out.

Personal

A presentation has been made to Mr. JOHN W. WEATHERHEAD, who is leaving the Middlesbrough Gas Department to take up the position of Chief Clerk with the Keighley Corporation Gas Department.

* * *

Mr. H. MCNAIR, Chief Chemist and Metallurgist to Messrs. Smith & Wellstood, Ltd., Ironfounders, Bonnybridge, has been appointed Technical Executive to Richmonds Gas Stove Company, Warrington.

* * *

Mr. WILLIAM STEVENSON, who has been with the Stirling Gas Light Company for the past seventeen years, has been appointed Engineer at Callander. He succeeds Mr. JAMES BELL, who becomes Engineer and Manager at Leslie.

* * *

Mr. R. O. ROBERTS, Technical Assistant and Chemist to the Rhyl Gas Department, was presented by the officials and staff with an oak bookcase on the occasion of his leaving to take up the appointment of Assistant Engineer to the Pudsey Gas Company.

* * *

After thirty-nine years' service as Secretary of the City of Durham Gas Company, Mr. THOMAS MARTIN WALLER has tendered his resignation which the Directors have accepted with regret, although they have decided to retain his services in an informal consultative capacity in appreciation of the work he has rendered.

Mr. Waller has for the whole of his career been connected with the Gas Industry, and before going to Durham was on the staff of South Shields Gas Company for nineteen years. His resignation will take effect on March 31.

* * *

Mr. WILFRID D. SPENCER, Ph.D., B.Sc., F.I.C., has been appointed head of the Research Department of Low Temperature Carbonisation, Ltd. Dr. Spencer was with Imperial Chemical Industries for seven years, during which time he spent three years as assistant to Mr. K. Gordon at Billingham, working on the development of the coal hydrogenation process and other coal oil problems. Dr. Spencer will also be in charge of the new research laboratories of the Company in London, which are being equipped to deal with important developments in connexion with the coal oil and chemical departments.

* * *

At the bi-monthly meeting of the Commercial Section of the North British Association of Gas Managers, Mr. R. S. JOHNSTON, Dundee, late Cashier with Dundee Gas Commissioners, and for the past thirty years Secretary and Treasurer of the Association, was met by his colleagues and presented with a wallet of notes. Mr. Garrie, Tayport, who is the Chairman for the ensuing year, made the presentation, and spoke of the high qualities and yeoman service given by Mr. Johnston to the Association since its inception.

Obituary

The death has taken place suddenly of Mr. ROBERT CAMPBELL, Engineer, Manager, and Secretary of the Carrickfergus Gas-Works Company. He had been in failing health for some years. He had held the position for the past forty years.

Forthcoming Engagements

February

3.—**Midland Juniors.**—Meeting and Paper by G. Bakewell, of Birmingham, "The Sale of Coke for Domestic Purposes."
3.—**B.C.G.A.**—Annual Meeting of Members in Midland District, Birmingham, 2.30 p.m.
5.—**Scottish Eastern Juniors.**—Short Paper Meeting at Dunfermline.
5.—**Manchester and District Juniors.**—Meeting at Blackpool. Paper by T. V. Blake, "A Six Years' Period Prior to the Removal of Blackpool Gas-Works."
7.—**G.C.P.A.**—Committee Meeting at 5, Victoria Street, S.W. 1, 2.30 p.m.
7.—**London and Counties Coke Association.**—Technical Committee, Gas Industry House, 2.30 p.m.
8.—**Federation of Gas Employers.**—Central Committee, Committee Room No. 1, Gas Industry House, 12 noon.
8.—**N.G.C.**—Central Executive Board, Committee Room No. 1, Gas Industry House, 2.30 p.m.
10.—**B.C.G.A.**—Annual Meeting of Scottish Members, North British Station Hotel, Edinburgh, 2.30 p.m.
12.—**Scottish Western Juniors.**—Meeting and Paper by E. Smith, of Dumbarton, "Stores Control and Job Costing."
14.—**W.G.C.**—Executive Committee, Gas Industry House, 2.30 p.m.
15.—**I.G.E.**—Gas Education Executive Committee, 2.30 p.m.
15.—**W.G.C.**—Training Sub-Committee, 10.30 a.m.
15.—**I.G.E.**—Gas Education Executive Committee, 2.30 p.m.
15.—**London and Southern Juniors.**—Meeting and Paper by E. W. B. Dunning, of the Gas Light and Coke Company, "The Relation of Design to Cooking Quality."
15.—**B.C.G.A.**—Annual Meeting of Members in Yorkshire District, Leeds, 3.45 p.m.
17.—**S.B.G.I.**—Council Meeting at 56, Victoria Street, S.W. 1, 2.30 p.m.
17.—**B.C.G.A.**—Annual Meeting of Members in the Southern District, Gas Industry House, S.W. 1, 2.30 p.m.
18.—**Southern Association (Western District).**—Commercial Meeting, Rougemount Hotel, Exeter, 2.30 p.m.
19.—**Scottish Western Juniors.**—Annual Whist Drive and Dance.
21.—**London and Counties Coke Association.**—Executive Committee, 11.15 a.m.; Central Committee, 2.30 p.m. Both meetings at Gas Industry House.
22.—**B.C.G.A.**—Annual Meeting of Members in the Manchester District, Manchester, 3 p.m.
26.—**Yorkshire Juniors.**—Meeting at Barnsley. Paper by L. Friedman, of Ascot Gas Water Heaters, Ltd.
26.—**Western Juniors.**—Visit to Bristol. Paper by A. B. Horsfield.
26.—**Scottish Juniors.**—Joint Meeting at Edinburgh. Paper by Col. W. Carmichael Peebles on "Governors."

February 21-March 4.
British Industries Fair, Castle Bromwich.
Feb. 24.—Joint Visit of Junior Gas Associations.
Feb. 25.—Joint Visit of B.C.G.A. Salesmen's Circles.
Feb. 28.—Visit of Women's Gas Council.
Mar. 1-3.—Joint Gas Conference.

March.
4.—**I.G.E.**—Research Executive Committee, 2.30 p.m.
7.—**I.G.E.**—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; General Purposes Committee, 3 p.m.

Letters to the Editor

Salaries of Gas Engineers

SIR,—I am very pleased to see that my letter relating to this question has received the recommendation of the Secretary of The Institution of Gas Engineers and also such a stalwart as Councillor Walter Muter.

I sincerely hope that your valuable "JOURNAL" will lend its assistance to this very worthy object, and give it the ventilation that I feel sure it deserves.

Yours, &c.,
C. S. SHAPLEY,
Engineer and General Manager.

City of Leeds Gas Department,
Market Hall, Leeds, 2,
Jan. 27, 1938.

I.H.V.E.

SIR,—We much appreciate your sympathy and interest in the serious position with which the Council and members of our Institution were faced last week-end, but we are glad to find that our Secretary, Mr. C. C. Ferguson, although of course seriously injured, has a fair chance of recovery, even though it is expected to take at least six months. Mr. Ferguson will be unable to receive visitors for some weeks, but letters may be addressed to him through Mrs. Ferguson, 26, Aspinall Road, Brockley, London, S.E. 4.

Many of your readers will be interested to learn that it has been decided that the normal proceedings of the Institution are to go on and the Council Meeting, Annual General Meeting, and the Annual Dinner will therefore be held according to the programme already issued. The Meeting will naturally be tempered with remembrance of our late esteemed President, but in his absence we know he would wish the progress and interest of the Institution to be maintained.

Yours, &c.,
T. F. C. POTTERTON.

Balham, S.W. 12,
Jan. 31, 1938.

Load Value of Appliances

SIR,—I had the privilege of attending the meeting of the London and Southern District Junior Gas Association when Mr. R. E. L. Tennyson-d'Eyncourt gave his Paper on "The Load Value of Appliances as a Guide to Sales Policy." I may say that I am able to sympathize with peculiar sincerity with Mr. d'Eyncourt in the difficulties which he must have encountered in preparing his Paper, for I am at present helping in an exactly similar investigation. At the moment we have only got far enough to enable us to realize the difficulties of disentangling the variables and arriving at useful conclusions even when working with a very considerable mass of data.

Analysis of consumption load values may be made, as far as I know, by three main methods. In the first method, hourly records are kept of the gas output, then by comparing charts for selected days so as to isolate the lighting, heating, and cooking peaks, and deducting the calculated industrial load, an approximation may be made to the mass value of the various loads for each quarter. This gives us an idea of what the gas is being used for, but little of the load value of individual appliances, and it depends upon a careful recording and interpreting of weather records, and a reasonably accurate evaluation of the industrial load. The second method is to fix check meters on selected appliances or groups of appliances on the premises of a number of typical consumers. There are obvious limitations to this procedure, but is a very useful way of obtaining information as to the behaviour and probable usage of a particular appliance.

The third method is to examine the consumption records of consumers in the light of the number and type of appliances which they are known to have installed. This is the method which Mr. d'Eyncourt has used with such interesting and sometimes rather startling results. I believe that it is a method of which great use may well be made, and Mr. d'Eyncourt's pioneer work in some of its applications, if it has not yielded clear cut and unchallengeable conclusions, is of great value in directing attention to both its possibilities and its limitations. One of the limitations he has not clearly defined, although he is obviously aware of it. He does not give the number of instances on which his average consumptions are based. This is an important point, both when the method used is to take all the available like instances, and when it is to take what is judged to be a sufficient number of samples and to argue from them to the whole. The variables which may affect the consumption are so many and of such a wide range of effort that sampling presents many difficulties. These may be reduced by analyzing the circumstances in each particular case and comparing as far as possible like with like, and on the face of it this should produce more useful results than the averaging of a large number of possibly dissimilar cases. The difficulty, however, of getting accurate information as to the circumstances, and the large number of possible attributes which in itself makes necessary a large number of samples, seems to me to make it rather advisable to limit the extent to which deductions may safely be made from the enquiry, and to use samples of the largest possible size. In the preliminary stages of the enquiry to which I have already referred we have found that any particular sample, selected by the attributes of like number and type of appliances installed, and like number of rooms in the house, must include at least 30 to 50 cases before the arithmetical average of consumptions becomes of any value. This may be shown by a study of trends when sufficient data is available.

We have also found that the method of subtraction to obtain the net consumption value for various appliances used by Mr. d'Eyncourt needs considerable qualification. For example, average consumption for cooker *plus* average consumption for wash boiler *plus* average consumption for a single fire (where all these can be isolated in considerable numbers in similar sized houses) does not give the average consumption for an installation of cooker, wash boiler, and fire. Also the average consumption for a particular appliance obtained by isolating it by the subtraction one from the other of different groups will vary, for the same appliance, according to the make up of the groups used. That is to say, if Mr. d'Eyncourt had compiled another table of fires only, and fires *plus* various water heaters, and then isolated the water heater consumptions by subtraction as he has done with cookers only, and cookers and water heaters, he would probably have got rather different results.

Some possible reasons for this are fairly obvious, but as we are not yet in a position to support conjecture by figures I am afraid I can do no more than draw attention to the pitfalls.

This is one method of selective sampling, however, which yields interesting and I think valuable results. That is the collection of data as to the annual and quarterly consumption, &c., of houses in which gas is the only fuel used. There are doubtless a great many of these in the London and Southern areas, and particulars which should include the size of the house, the appliances installed, the number of occupants, and if possible the weight and value of the solid fuel displaced (in which case the increase in gas consumption should be given as well as the total) would be of the greatest use to the Industry in planning its campaign towards its ultimate objective.

Yours, &c.,
JAMES M. A. MITCHELL.

Newcastle-upon-Tyne and Gatehead Gas Company,
Jan. 28, 1938.

"GAS JOURNAL" Directory

In order that readers may be able to keep the particulars contained in the "JOURNAL" Directory up to date, we summarize in the following list various changes which have occurred during the past month.

Page 8. BOLTON. H. Platt appointed E. & M., vice W. J. Smith, retired.
" 22. EASTBOURNE. S. W. Hammond, E. & W. M.
" 22. DURHAM. T. W. Waller, S., retires at March 31.
" 24. FALMOUTH. H. H. Hoare, E. & M., deceased.
" 24. FARNWORTH. F. B. Allen, S., retired.
" 32. HECKINGTON. R. E. Wiles, E. & M., resigned.
" 32. HINDLEY. P. Greenough, E. & M., deceased.
" 46. MID SOUTHERN. R. W. EDWARDS, M.D., deceased.
" 54. QUORNDON. Taken over by Loughborough Gas Department.
" 66. SWADLINCOTE. C. H. Taylor, E. & M., resigned.
" 80. CALLANDER. W. Stevenson appointed E., vice J. Bell.
" 84. HADDINGTON. J. Blair, M., retired.
" 88. LESLIE. J. Bell appointed E. & M., vice T. F. Scott.
" 125. SOUTH-WESTERN. R. B. H. Ottley appointed Chairman, vice S. J. Ingram (who retains seat on Board).
" 130. GEELONG. W. M'L. Ross, M., retired.

News of the Week

Notice of a Motion that the post of Lighting Inspector to the Corporation be revived is to be given by Councillor Douglas M. Christie at the next meeting of the Dundee Council.

Gas Films were shown to members of the Newark Corporation Gas Committee at the Technical College, Newark, on Jan. 24. The public will be given an opportunity of seeing these films at a later date.

An Up-to-Date Showroom, replacing former old premises, has been opened at Irthlingborough by Wellingborough Gas Light Company. Since the summer of 1937, Irthlingborough has received its supply of gas direct from Wellingborough, the local Works having been demolished. Further details of these fine premises, together with photographs, will appear in an early issue.

An Interesting Lecture was delivered by Mr. T. B. V. Hirst, of Ascot Gas Water Heaters, Ltd., at the Cheltenham Technical College Lecture Theatre on Jan. 25. This was attended by a large number of local heating engineers, plumbers, and gas fitters. A keen discussion ensued, at the conclusion of which a vote of thanks to Mr. Hirst was proposed by Mr. A. L. Morris, Accountant and Commercial Manager of the Cheltenham and District Gas Company.

The List of Appeals for hearing during the present Law Term includes that of the Egham and Staines Electric Company from the judgment of Mr. Justice Farwell on July 19 last, in their action against the Gas Light and Coke Company, for injunctions in respect of allegations that the Gas Company superimposed hotplates on the Electric Company's cookers. Mr. Justice Farwell, it will be recalled, found in favour of the Gas Light and Coke Company.

The Test which had been Proposed following the suggestion of the Ministry of Health to take place in Gloucester with the object of determining the comparative efficacy of gas and electricity for street lighting has, we learn, been postponed. It was reported at last Wednesday's meeting of the Gloucester City Council that a letter had been received from the Gloucester Gas Light Company's Solicitor intimating that the Company reserved their right to object to any decision of the Minister of Health in regard to the matters discussed at the interview which representatives of the Corporation Electricity Committee had with the officers of the Ministry on Nov. 23 last. The Town Clerk stated that in consequence of the letter the Chairman of the Committee had given instructions for the experiment proposed to be postponed. The Committee had confirmed the Chairman's action.

It Was Decided to Oppose the proposed Bill in Parliament of the Canterbury Gas and Water Company at a special meeting of the Canterbury City Council on Jan. 19. The Bill, it will be recalled, provides for the conversion and amalgamation of existing capital, the raising of additional capital, the conferring of further powers, and other purposes. The Council acted on the advice of their officers and a financial expert.

The First Meeting in the New Year of the Redditch Ladies' Gas Circle was held on Jan. 20 at the Redditch Gas Company's showrooms during a week of cookery demonstrations by the Company's demonstrator, Miss Carol Hill. Over a hundred members spent a most enjoyable afternoon. Mr. C. R. Hackett, Secretary of the Company, introduced Miss H. Zimmermann, of Radiation Ltd., who gave a lecture on Continental Cookery, which was greatly appreciated by the members. Miss Hill proposed a vote of thanks to Miss Zimmermann. This was seconded by Mrs. Fletcher. Tea was served and a small gift was made to each member to mark the third year of the Circle's existence.

In a Report on Public Lighting, Mr. L. St. G. Wilkinson, Borough Engineer and Surveyor for Wallasey, stated that the total mileage of roads and streets within the area of the Borough of Wallasey lighted either by gas or electricity was over 97. The length of classified roads was 17¾ miles, and unclassified roads 80 miles. The length of roads lighted by gas was as follows: Classified roads, 13¾ miles; unclassified, 59¼ miles; total, 73 miles. The length lighted by electricity was: Classified roads, 4 miles; unclassified, 20¾ miles; total, 24¾ miles. The total number of gas lamps was 3,409 and electric lamps 747. The total number of hours per annum during which street lighting was provided is 3,844 electric lighting and 3,711 gas lighting.

Record Outputs for December were reported at a meeting of the Aberdeen Gas Committee on Jan. 26. For the first time in its history, the Department exceeded the figure of 200 million cu.ft., the quantity of gas actually produced during the month being 200,307,000 cu.ft., which was 6,140,000 cu.ft. more than in the previous December. Two other records were also broken by the Department last month. On Dec. 16 the greatest quantity of gas ever made in one day was produced—viz., 7,083,000 cu.ft., and on Hogmanay the previous record for the greatest output in one day was broken. On Dec. 31 the output was 7,558,000 cu.ft. Mr. Samuel Milne, Engineer and Manager, stated it was largely due to increased domestic consumption that the new records had been made.

The Institution of Gas Engineers

Members of The Institution of Gas Engineers will be welcome at several meetings of technical associations this month. There is a meeting of the Illuminating Engineering Society on Tuesday, Feb. 8, at 7 p.m. in the Lecture Theatre of the Institution of Mechanical Engineers. Light refreshments will be provided at 6.30 p.m. A discussion on the Final Report of the Ministry of Transport Committee on Street Lighting will be opened by Dr. J. W. T. Walsh and followed by a discussion. At the conclusion a special film showing methods of testing visibility in streets will be shown, but as a demonstration only and not as a subject of discussion. Tickets can be obtained from the Secretary, The Institution of Gas Engineers, 1, Grosvenor Place, London, S.W. 1.

Also on Feb. 8 is a meeting of the Institution of Petroleum Technologists. This will be held at 5.30 p.m. at the Royal Society of Arts, John Street, W.C. 2. Tea and light refreshments will be served at 5 p.m. An Address will be given by Lieut.-Col. R. A. Thomas, C.B.E (Home Office), on "Air Raid Precautions, with reference to the Storage of Petroleum." No tickets will be required.

A meeting of the Institute of Fuel will be held on Thursday, Feb. 10, at 6 p.m., in the Meeting Room of the Junior Institution of Engineers, 39, Victoria Street, S.W. 1. A Paper will be presented and discussed at the meeting by Dr. E. G. Ritchie on "Steam and Hot Water Accumulation in an Industrial Plant." No tickets will be required.

A sessional meeting of the Institution of Sanitary Engineers will be held on Friday, Feb. 11, at 6.30 p.m., at Caxton Hall, Westminster, S.W. 1. Tea will be provided at 6 p.m. A Paper will be read and discussed at the meeting by Colonel W. Garforth, D.S.O., M.C., on "Structural Precautions and Shelter Protection in Air Raids, together with a short account of Effect on Underground Services of a Bomb Bursting on the Roadway." Tickets for the meeting can be obtained from the Secretary of The Institution of Gas Engineers.

The Coal Position at Edinburgh

A loss of £27,000, equal to 2d. per 1,000 cu.ft., has been incurred by the Edinburgh Gas Department during the past three months owing to a shortage of coal supplies. Reporting to the Public Utilities Committee on Jan. 29, the Engineer and Manager, Mr. James Jamieson, said that for November, December, and January the Department ordered 91,900 tons and received 71,700. To make up for short deliveries about 10,000 tons had been taken from stock at a handling cost of £1,034; water gas plant had to be put into action in December, the increased cost of operating it being £1,540; benzole production had to be suspended to conserve supplies, a revenue loss of £1,050 being thus incurred by the Department. Coal stored in the open depreciates and loss in carbonizing this coal is estimated at £2,500, the winter months losses coming therefore to £6,124.

They could only use a proportion of Lothian coal in Edinburgh, and 40% of their requirements were drawn from Lanarkshire and Stirlingshire. Deliveries from these sources had been most erratic, and, as they had to make up the difference with Lothian coals, working results had depreciated considerably. There had been a reduction in the thermal yield of about four therms per ton of coal carbonized, costing the Department £13,500. The lack of caking and swelling coals had also depreciated the quality of the coke. More breeze had been produced and a loss of £6,250 was estimated in coke revenue. The sum of these losses was £27,000, while, in addition, they were paying from 4s. to 6s. more per ton of coal, representing £60,000 extra over the year. Carbonizing plant was also affected by the inferior coke and approximately 10% more retorts had to be kept in operation.

It was agreed that a copy of Mr. Jamieson's report be sent to the Minister of Mines, the Secretary of State for Scotland, local Members of Parliament, and to the National Gas Council. It was also resolved to communicate with the Glasgow Corporation on the matter with a view to joint action being taken.

The Liverpool Company's New Showrooms

Following the official opening of "Radiant House" by the President of the Board of Trade on Jan. 24, to which we referred in detail last week, the guests were entertained by the Chairman and Directors of the Liverpool Gas Company at luncheon at the Adelphi Hotel.

Guests Entertained at Luncheon

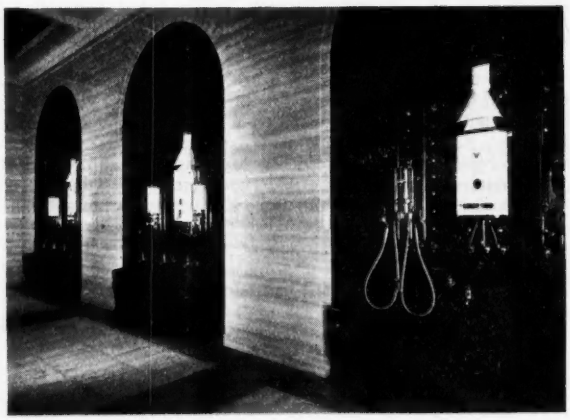
The Rt. Hon. Oliver F. G. Stanley, M.C., M.P., President of the Board of Trade, proposed the "City of Liverpool" with which his family has always been closely connected. He referred to the apparent slackening of industrial activity during the last two months of 1937. This was emphasized by the too artificial activity of the early months of 1937 and recently there had been adverse foreign influence, including a slump on the American markets. He, himself, saw no reason to join with the pessimists who thought that the present recession was the beginning of a deeper and more serious slump. The Government were making a great effort to increase industrial activity by pursuing the policy of trade agreements. Just now they were entering upon a most important Trade Treaty, namely, with the U.S.A. They had had many difficulties to overcome, but he could assure his audience that on both sides of the Atlantic there existed a sincere desire to succeed. He emphasized that it was not a political agreement which they had in view, but a proper Trade Treaty.

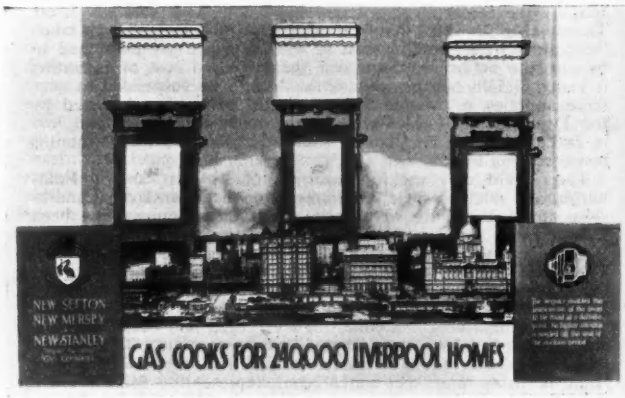
The Lord Mayor of Liverpool, in his reply, referred to their hosts as the oldest and strongest provincial gas company in the kingdom. The Corporation did not look upon the Company as rivals but as partners, as witness the fact that there were still some 600 miles of streets in Liverpool lighted by gas, and that the Corporation were responsible for testing 17,000 to 18,000 gas meters a year. The spirit of partnership was evidenced too by the beautiful building which the Company had erected in Bold Street, which brought back some of the old atmosphere to that important shopping district in the heart of the city. Liverpool thanked the Company and hoped their enterprise would meet with the success it had merited.

Mr. Frank H. Jones, President of the South Metropolitan Gas Company, proposed the toast of the "Liverpool Gas Company"—a very great pleasure in that his family had always been keenly interested in the gas history of the city. He recollected being told both by his grandfather and his father to "watch Liverpool." This new enterprise of the Company was a milestone not only in its history, but in that of the whole Gas Industry. He could recall no gas undertaking which had had the courage to visualize and create such an efficient thing as this new and beautiful building. He had been admiring the heating system, in fact, all the arrangements made to improve the conditions under which the staff worked. He knew the board rooms of many great companies in London; but he, personally, had never aspired to such as he had seen that morning. The enterprise and boldness of the Liverpool Gas Company would bear fruit and it was a wonderful thing for the Gas Industry. Mr. Jones then quoted the following paragraph from the brochure which was distributed to the guests:

> It is "policy" which makes or mars business, and it speaks volumes for generations of Liverpool Gas Company Directors that their successive administration has brought the undertaking to its present strong position. The price of gas in Liverpool, Bootle, Crosby, Litherland, Huyton and district is nearly the lowest in the country, and it is certain that the policy will not be altered to accommodate unsound schemes to achieve spectacular increases in the sale of gas at the ulti-

In the accompanying photographs we show two of the very fine window displays in the Liverpool Gas Company's new Showrooms. On the right is an attractive setting for "Ascot" Gas Water Heaters, while below is the novel John Wright display as it appears by day and by night.





This display has excited great interest; it represents, of course, the City of Liverpool seen from the river. Above the model are "Mersey," "Sefton," and "Stanley" cookers in green and primrose "Beau" finish. A very great degree of realism has been obtained, everything, including human figures, being true to scale. The model boats ply the river, and at night the windows of all the buildings and portholes of the boats are illuminated. Another interesting feature of this model is that the clock in the Royal Liver Building actually records the time. The display is about 10 ft. long, and it took several weeks to complete. The front and back are carried out in pale green silk, white velvet, and gold cut-out lettering.

mate expense of the consumer. The test of soundness is the amount of capital invested per consumer. In the case of the Liverpool Gas Company it is £18—an exceedingly low figure.

In conclusion, the speaker referred to co-partnership, such an important phase of the Liverpool Company's activities. Where co-partnership existed it meant that everyone not only worked for the Company, but understood and was a friend of that Company.

Sir Christopher Clayton, C.B.E., J.P., responding, thanked the Lord Mayor for his kind speech and expressed the hope that the Corporation and the Company would continue to work closely together for many years to come. He, himself, had met the Electrical Engineer, Mr. P. J. Robinson, for the first time that morning and they had agreed that competition was the best thing for both. The result was cheaper production and closer co-operation with the manufacturers, which was of great value to the City of Liverpool. He also thanked Mr. F. H. Jones; from him he had learnt much during a long Club association. Speaking generally, he mentioned that the Company had left Duke Street premises mainly owing to the rapid increase of their business. Their area now covered 115 square miles and a further advance was anticipated. The Duke Street premises had been definitely cramped since their last three absorptions. The Company were now in a position to show everything the Gas Industry had to offer, not only to the householder, but to industrial and business firms. Then they had wanted a really up to date office. It was an enormous asset to a Company to be able to make the work people comfortable, in which connexion Mr. Clayton referred to the temperature control which existed in every room in the building. He thought other offices in Liverpool would be well advised to look into the system. Finally, the Chairman referred to the Architect, Lieut.-Col. Ernest Gee, F.R.I.B.A., to the Contractors and Sub-Contractors, to the people who had worked under them, and to the Liverpool workmen whom they had employed.

In conclusion, the Chairman's health was proposed by Sir Frederick Marquis, Director of Martins Bank and Lewis', Ltd.

Among the Sub-Contractors who have assisted in the construction and equipment of "Radiant House" the following names are well-known in the Gas Industry: F. Braby & Co., Ltd. (metal stairs); "Euk" Manufacturing Company, Ltd. (dishwashing machine); Evered & Co., Ltd. (gas fittings); C. Harvey & Co., Ltd. (special gas fittings in Board Room suite); Mather & Platt, Ltd. (armoured fire doors); Thompson & Capstick (special decorations and gas fittings); Frederick Tibbenham, Ltd. (Board Room suite, furniture, &c.).

The Fruits of the Coal Survey

At a Meeting of the Fuel Luncheon Club held on Thursday, Jan. 20, with Lord Strabolgi in the chair, Dr. F. S. Sinnatt, C.B., M.B.E., Director of Fuel Research, gave a description of the work being done by the Fuel Research Coal Survey.

He said the first Committee was appointed in 1922 to deal with the Lancashire coalfield. The whole organization of the Coal Survey was elaborated slowly in the early years, because not only had the staff to be trained, but the laboratories had to be carefully selected and then fully equipped. In each coalfield a Coal Survey Committee was appointed, made up of coalowners and managers, local scientists, representatives of the Geological Survey, and the Director of Fuel Research. The duties of the Committees were to select the seams to be surveyed and to consider in detail reports on seams before they were published. There were now 13 Committees and 9 laboratories, and the organization covered over 98% of the coal being raised.

The essence of the Coal Survey was to obtain pillar sections of the seams as they existed underground. These pillar sections were obtained by the senior officer of the Fuel Research Organization in each coalfield or by his assistant. The pillars were carefully packed in suitable boxes and conveyed to the local laboratory under the officer's direct supervision. The investigation of the seam was carried out in the greatest possible detail, and when necessary the laboratory information was reinforced by experiments on a large scale carried out at the Fuel Research Station.

It was now possible in some of the coalfields to review the analyses as a whole, and certain values such as the volatile matter of the coal, the tar produced on carbonization, &c., were being plotted on the map of the district and showed a definite trend in the values. Changes in the properties of the coal in certain districts had long been known in a general way, but it was impossible to plot the results accurately since the methods of analysis and sampling used in the past had not been uniform. Taking the percentage of volatile matter as the criterion, lines of equal volatile matter could be plotted (isovols) accurately on the maps of the coal area. This was one of the great fruits of the Coal Survey. It has brought order into the question of the survey of certain important seams in the country. Isovol maps had been prepared for a number of the seams in the Durham coalfield, and a report on the Busty seam would be published [this was issued last week—see "JOURNAL," Jan. 26, p. 237] in which the "isovols" of the seam would be available. This map was shown and discussed in relation to the known distribution of the accepted trade types—*e.g.*, coking, gas, steam, and house coals.

Dr. Sinnatt also mentioned the "isovol" map which had been prepared for the Nine Foot Seam of South Wales, and the trends which had been recognized connecting the Warren House seam of the West Yorkshire coalfield with the Barnsley seam of the South Yorkshire coalfield, and this again with the Top Hard seam of the Nottingham and Derbyshire coalfield. This seam had been examined over the whole of this important area, covering about 750 square miles. The results were available over a distance north to south of 60 miles—*i.e.*, from Leeds to Nottingham. The total amount of coal originally present in this single seam in the area surveyed was over 4,000 million tons.

A rough estimate had been made of the total coal which had been surveyed up to the present, and it was a figure approaching 30,000 million tons.

Dr. Sinnatt gave one or two instances of the way in which the Survey had been able to find coals possessing special characteristics, and thus finding new markets for certain coal seams.

Giant Steam Accumulator's Journey

Many of our readers will have heard in the 10 o'clock Regional News Bulletin the other night an account of the 330-mile journey from Annan (Dumfries-shire) to the Beckton Works of the Gas Light and Coke Company of an enormous steam accumulator, when two members of the staff who accompanied it spoke over the wireless.

The accompanying photograph shows the accumulator passing along the Barnet By-Pass, near Hatfield, on the final stage of its run, when its size may be judged by comparison with the car alongside. Constructed by Cochran & Co. (Annan), Ltd., under

On the Barnet By-Pass.

the licence of Ruths Arca Accumulators, Ltd., the apparatus, which has a working pressure of 300 lb./sq.in., measures 11 ft. 3 in. in diameter by 66 ft. long, having a net weight of some 82 tons and a gross road weight, with bogies and tackle, of 112 tons. Owing to its immense size the whole of the journey had to be undertaken by road, and it is believed to be the heaviest road haulage job ever carried out in this country. The journey occupied nearly four weeks, the average speed being only 2 m.p.h., though the maximum speed on the level was, of course, somewhat in excess of this.

In addition to the accumulator and its bogies, the convoy consisted of three tractors, a caravan for the staff of eleven who accompanied it, and a coal tender. On the level two tractors were sufficient to tow the monster; for uphill work, however, all three were required in front, while for descending steep gradients one tractor stayed in front and the other two were coupled up behind to act as brakes. Brakesmen also travelled on the bogies themselves, as can be seen in the photograph. Weather conditions were unfavourable for much of the journey, and the convoy was snowed up for several days in the vicinity of Shap. Completing the last stage of the run through London by night, the giant steam accumulator was safely delivered at the Beckton Gas-Works last week.

The Output of Coal in Great Britain for the week ended Jan. 15 amounted to 5,206,100 tons, compared with 4,790,100 tons in the previous week, wage earners employed numbering 791,200, compared with 790,200.

"Stresses in Spirally Guided Gasholders"*

Reviewed by George Evetts, M.Inst.C.E., M.Cons.E.

As far as the writer is aware, until this book appeared there has been no publication dealing with the stresses peculiar to spirally guided holders. It will be remembered that Mr. F. S. Cripps dealt with the general question of the stability of holders of all classes, and wrote his well-known book on the Guide Framing of Gasholders in 1889. He followed this up in 1893 with a short volume entitled "Gasholders with or without Guide Framing, which was referred to as "a discussion between E. Lloyd Pease and F. Southwell Cripps." In the Preface to this book Mr. Cripps referred to Mr. W. Gadd, the inventor of the spirally guided holder, and stated that Mr. Gadd's theories and contentions in respect of the advantages of the spiral holder from a scientific and engineering point of view had long since been refuted and needed no further comment.

It is generally understood that Mr. Gadd's theories are not accepted, but, neglecting theory for the moment, the advance in the practical design of spiral holders leaves no doubt that the modern structure is a sound engineering job. To-day one accepts spiral holders without question, and their record as engineering structures, their life and their freedom from accident, should be sufficient justification for their continued existence, even without approving of the theoretical method of approach in the design. One may have personal views about the relative stability, difficulty of access and such like, but one must accept the advantages in first cost and the fact that all the rollers and working parts are accessible for adjustment.

Mr. Milbourne has shown that the design of the spirally guided holder can be approached from sound principles, whatever may have been the case in the past. It will be realized that in the case of the modern guide framed gasholder, the stresses are ultimately carried by the columns and the bracing of the guide framing, and finally reach the foundation at ground level, or in certain isolated cases the stresses are taken by the tank curb and balcony. In the spiral holder, however, these stresses are transferred from roller to roller and finally to the tank rollers in all cases. It is interesting to note that in the early days spiral holders carried the guide rails on the adjoining lift. Thus the outer lift guide rail was fixed spirally round the interior of the tank, but this was obviously unsound, because it continued the old fault of partially inaccessible rollers.

Mr. Milbourne's book deals with the stability of floating structures, wind and snow loads on inflated and empty holders. There is a chapter on stresses in the side and crown sheeting, curbs, cups, and grips. He traces the effect of these stresses down to the final tank rollers, and has a chapter on the steel tank stresses and shows how the calculations are made to deal with the water pressure and the stresses on the tank and balcony due to the wind pressure on the holder. He also deals with the incidence of the loads on the foundations, and has a special chapter dealing with the crown framing which gives typical funicular polygons and stress diagrams. Finally, there is a useful chapter on riveted joints dealt with rather more fully than in the average text book.

There appears to be one slight error: on page 22, the bottom lift of the holder shown thereon should presumably be 81 ft. instead of 80 ft.

This book should be read by every gas engineer or aspiring gas engineer who wishes to understand the principles of design of a spiral holder, and in reading it he will go a very long way towards understanding the design of holders in general.

Mr. Milbourne is to be congratulated not only on tackling this problem, but on the method in which he has dealt with it. He could, however, do us one further service—*i.e.*, produce a companion volume showing the design of, say, a 5 million cu.ft. holder from beginning to end, based on the principles and formulæ used in this book. Such a volume would complete the set, as well as making a companion volume to his father's valuable book of 1923 on the Design and Construction of a 12½ million cu.ft. Column Guided Holder.

As a final round off, is it too much to ask for a volume on Waterless Holders?

* "Stresses in Spirally Guided Gasholders," by S. M. Milbourne, A.M.I.Struct.E. Published by Walter King, Ltd., 11, Bolt Court, Fleet Street, E.C.4. Price 25s. post free.

Fuel Department of Leeds University

In his Report to the Coal Gas and Fuel Industries Committee on the work of the Fuel Department of Leeds University for the session 1936-37, Professor J. W. Cobb states that the number of students in the Department reached a high level during the Session under review, and a slight increase from 37 to 41 has occurred this session. Three of the latter are occasional students attending for a few hours only per week, and one is an industrial research student. Of the remainder, 25 are preparing for degrees in Gas Engineering, 10 in Fuel and Metallurgy, and 2 are candidates for Post Graduate Diplomas in Fuel and Metallurgy.

The analysis of the number of students in the Department is as follows:

	1935-36.	1936-37.	1937-38.
1st year B.Sc. course	14	15	9
2nd " "	7	9	11
3rd " "	5	8	11
Post graduate diploma	—	1	2
Post graduate research students	3	2	4
Industrial research	—	1	1
Occasional	—	1	3
	29	37	41

Institution Gas Research Fellowship.

Mr. A. A. Taylor, M.Sc., of Manchester College of Technology, was appointed to the Gas Research Fellowship, commencing work in December, 1936. He has continued the investigation of the influence of sulphur dioxide and other gases in furnace atmospheres on the rate of oxidation of steels, carrying the work up to the high temperature of 1,400°, representing conditions of welding practice. The experimental difficulties encountered in this higher range of temperature are considerable.

Appointments.

A. A. Clark, B.Sc.	Messrs Clayton, Son, & Co., Ltd.
J. Castle, B.Sc.	Messrs. W. C. Holmes & Co., Ltd. Now Assistant Manager, Brighouse Corporation Gas Department.
G. Milner, B.Sc., Ph.D	Chemical Engineer, Messrs. Ashmore, Benson, Pease & Co.
A. Lister, B.Sc.	Gas Light and Coke Company.
K. Bolton, B.Sc.	"
J. H. Dyde, M.Sc.	Engineer and Manager, North Middlesex Gas Company.
F. C. Pybus, B.Sc.	South Yorkshire Chemical Company, Ltd.
E. Simister, B.Sc.	Research Metallurgist, Alloy Steels Research Committee.
W. R. Branson, M.Sc.	Assistant Manager, Cardiff Gas Light and Coke Company.
G. E. Holmes, B.Sc.	H.M. Factory Inspector.
P. Wedgewood	Chief Chemist, Watford and St. Albans Gas Company.
F. Broomhead, B.Sc.	Messrs. W. C. Holmes & Co., Ltd.
W. Rhodes, B.Sc.	Weston-super-Mare and District Gas Company.
C. V. Rollinson, B.Sc.	Messrs. British Ropes, Ltd.
W. Etheridge, B.Sc.	Chemical Engineer, Messrs. Courtaulds, Ltd.
K. Sheard, B.Sc.	Chemical Engineer, Messrs. Newton Chambers & Co., Ltd.
W. H. Kay, B.Sc.	Messrs. John Knowles & Co., Burton-on-Trent Refractories.

Dr. H. S. Houldsworth, who resigned his post as Assistant Lecturer in Refractory Materials in the Department in 1925 on being called to the Bar, has now been made a King's Counsel. In addition, he has been selected as Independent Chairman of the District Co-ordinating Committee of the Midland (Amalgamated) District (Coal Mines) Scheme, 1930.

Graduates.

B.Sc. Honours—1st class.

Gas Engineering—F. Broomhead, B.Sc.
Fuel and Metallurgy—E. Simister, B.Sc. (Leblanc Medal).

B.Sc. (Ordinary).

G. Brook.
W. H. Kay.
F. C. Pybus.
R. V. Riley.
C. V. Rollinson.
W. Rhodes.
H. Taylor.

Post Graduate Diploma (Gas Engineering).

R. W. H. Harris, B.Sc. (Bristol).

Institution of Gas Engineers.

Diploma in Gas Engineering (Supply), F. Bell, B.Sc. This is in addition to a Diploma previously awarded to him in Gas Engineering (Manufacture).

A.R.P. and the Gas Industry - - - -

By F. C. SHERRIFF, of the "JOURNAL" Staff,

who, through the courtesy of Mr. James Mitchell, the City Gas Engineer and Manager, was given special facilities as an observer in the great experimental black-out at Leicester last Thursday. The study given to the A.R.P. problem in that city, and particularly the part played by the Gas Undertaking, will be found of first-rate interest to others who are occupied with plans to meet their own particular conditions.

Present indications are that the country is at last beginning to awake to a true appreciation of the importance of air raid precautions, and while a very great deal remains to be done, it is gratifying to note that practical steps are being taken in many quarters to bring home to the public the paramount necessity of being fully prepared for what is likely to be one of the principal forms of attack in the future—namely, the aerial bomber.

It is not, however, merely a matter of educating the public to fend for itself; of equal importance is the rapid mobilization of emergency personnel to deal with casualties, fires, and the effects of poison gas, which latter, in spite of the Geneva Gas Protocol of 1925, still constitutes a potential war hazard. Moreover—and this is a point of vital moment—it is essential that whole areas which may lie within the line of flight of enemy aircraft be quickly and effectively "blacked-out," and so present no visible target for bombs.

Before dealing specifically with the comprehensive experiment at Leicester, it may be well to review the problem in a few general terms. The man-in-the-street has, unfortunately, only the vaguest ideas about the whole matter. The subject was dealt with recently in a series of excellent articles in *The Times*, when local authorities were taken to task for preening themselves on elaborate paper schemes or on their success in marking time while the financial question was being fought out. Eight valuable months were lost during last year. Yet the problem is such that public awareness and interest are the very essence of any scheme of precautions.

As was pointed out in the series of articles to which we refer, the chief offensive weapon of to-day is the bomber. Its object is to impose upon a hostile population the will of the Government which sent it. Its method is to cause panic, cripple the economic life, and wreck communications and vital industrial processes. Only a population organized in defence, self-discipline, and self-help can defeat that policy. Shelters, gas-masks, fire brigades, and medical services are only the superstructure; they collapse if the foundation is not there. And that foundation is the instructed individual household.

Enthusiasm of Individuals.

The remarkable progress made in a few areas—of which Leicester is an outstanding example—has been due entirely to the enthusiasm and initiative of individuals. In parts of the country the public have shown the keenest interest; but the response of business men and tradesmen has generally been wretched. The Gas Industry has a wonderful opportunity of setting an example in this connexion, and, indeed, a National Joint Committee has already been formed to investigate and recommend measures for maintaining the supply of gas despite damage caused by air raids, and also to recommend precautions to be taken with regard to the protection of gas-works during air raids.

The Home Office have appointed Wing-Commander Hodsoll as Inspector-General of Air Raid Precautions, and he has combined with the work of planning, thinking, advising, and administering the task of touring the country to address local authorities on their duties. As a result much has already been done, and, indeed, "black-outs" have been staged in several districts. And this brings us naturally to the subject of the present article—namely, the experiment last Thursday night at Leicester, when a full-scale "black-out," accompanied by the manœuvres of emergency patrols manned by the personnel of all the municipal departments, was witnessed by Wing-Commander Hodsoll himself and other officials from the Home Office and representatives of many London and provincial centres. And while all this was going on in the streets of Leicester, Mr. Geoffrey Lloyd (Under-Secretary to the Home Office) was flying over the darkened city at a height of 2,000 ft. in a R.A.F. bomber with the object of observing whether and at what points lights were visible. There were in all nearly a hundred vehicles patrolling the streets, including a skeleton service of darkened trams and motor omnibuses to represent the possibility of evacuating the civilian population under cover of darkness, police cars, fire engines, ambulances, emergency squads from the various municipal departments, and a number of private cars to provide a simulation of normal traffic conditions which might be expected in such circumstances.

Traffic in Darkness.

A seven-mile route was mapped out around the centre of the city, various sections of streets being treated in different ways with a view to obtaining information as to the method which provided the best conditions for the drivers with the small amount of illumination given forth by their specially shielded head-lamps. Other measures adopted to ensure the success of the experiment included the co-operation of the two railway companies whose lines serve the city in extinguishing the lights in such passenger trains as happened to be passing through the area during the "black-out;" they also agreed to carry out their essential operating movements with an absolute minimum of light—such, for example, as the screening of the glow from locomotive firebox doors, the shading of signal lights, station lamps, &c. Some 650 manufacturing concerns throughout the area readily agreed to suspend their night shifts during the "black-out" and subdue all factory lights. This gesture is particularly noteworthy when it is realized that the suspension of work, even for so comparatively short a period in the middle of the night, entails in many cases a loss of wages to the employees and a reduced turnover for the firm. Nevertheless, as our participation in the patrol showed, their co-operation was wholly effective, and the small glimmers of light that were visible from the ground must have been entirely invisible from the air.

THE GAS UNDERTAKING'S RÔLE.

Blacking-Out the Works.

Before proceeding to set down our impressions of the actual "black-out" itself, we must visit the gas-works and see what part they played to render the experiment complete, and in doing so we are considering the part which *all* gas undertakings—whether municipal or company owned—must reasonably be expected to play in connexion with this vitally important matter of air raid precautions.

Only last week we had a reassuring statement from Edinburgh regarding the vulnerability of gas plant in air attack. It is concluded that in the event of damage by bombs to plant escaping gas might ignite but would not *explode* except in very exceptional circumstances. No single case was recorded of a hit on a gasholder causing explosion during the last war. Nevertheless, there is no need to emphasize the paramount necessity for measures to be taken to render the manufacturing stations of so essential a public service as safe as is humanly practicable. We are not, however, now dealing with the *protection* of gas plant from bombs by concrete means; that is not the immediate idea of air raid precautions. There are probably no wholly effective means of protecting a gas-works—or any other works, for that matter—from indiscriminate bombing. Nor yet can we guard against the

enemy airman who, hard pressed and anxious to make a speedy getaway, unloads all his cargo at once to lighten his 'plane. We can, however, by following the plan adopted at Leicester, "black-out" our gas-works to such a degree as to present the minimum of visible target even for low-flying aircraft; and experience has shown that bombing machines are, as a rule, only too anxious to stay as far away from the ground as practicable—an object which the balloon barrages will undoubtedly stimulate. We said a *minimum* of visible target rather than *no* visible target because, however effective the blacking-out of the gas-works, one cannot black-out the moon with any success; and it is possible that on a bright moonlight night so bulky a piece of plant as a gasholder would be seen from quite a considerable height. In such circumstances, therefore, as well as from the point of view of daylight raids, it may be necessary to consider the application of some form of camouflage to gas plant generally.

While no claim is made that the steps taken to "black-out" the Leicester Gas-Works are by any means perfect, they serve to show how comparatively simple a matter it is completely to darken a modern gas-works. They also show that no great expense is involved in this side of the matter; no expensive or complicated equipment is necessary—indeed, just a few "bits and pieces" which can be readily obtained on any gas-works; just a little whitewash and the use of a certain amount of intelligence in the shielding of essential lamps—and this part of the job is done.

The Carbonizing Plant.

Let us turn first to the carbonizing plant, where shift work calls for the provision of light at various points throughout

The Leicester Gas Department's A.R.P. Officer Instructing a Squad of Men at the Works.

the night. A survey of these lights quickly showed that many of them could be dispensed with straightaway, thus simplifying the matter considerably. Then those at the discharge end of vertical retort installations are mainly invisible from the outside in any case, and the screening by plywood, canvas, or tarpaulin of the few entrances to the house at ground level is all that is required here. It is when we reach the upper stages of the retort house that we begin to appreciate how exceedingly annoying are all those great windows and artistic openwork designs which are thoughtfully incorporated in the plan for ventilation purposes. It is difficult, for instance, to fit really effective blinds to a series of "windows" measuring anything up to 12 or 15 ft. square, quite apart from the vent which usually runs along the gable of the roof and lets light out quite as readily as smoke and fumes.

The essential lamps on the upper stages, therefore, have to be specially treated, and three alternative methods were adopted at Leicester according to the situation of the lamp. Those at the very top of the bench, above the coal bunker feeds, were fitted with conical metal shields to throw a dim light directly downwards where required. The globes of other pendent lamps on the higher stages were dipped two or three times in a limewash containing a large percentage of blue, either the hole in the bottom of the globe or a small additional area immediately surrounding it being left for diffusion of the light. The remainder of the globe showed up only as a dim blue patch. The advantage of this method is that the "wash" can be readily flaked off again when not required. A certain amount of light is, of course, necessary at the pricking level, and here the same type of pendent lamps were treated in a different manner. Metal cylinders about 18 in. long—which can easily be "knocked up" in the tin shop—were fitted round the globes close up to the under side of the lamp reflector, to which they were wired. To prevent undue lateral reflection from the bottom of the metal, the last six or eight inches were painted black, while in order to throw a subdued illumination over the stage a small strip of the metal was cut away half-way round the lower circumference on the inside of the cylinder in relation to the retort house walls. All "danger" points in the retort houses, such, for instance, as sharp corners, steps, and stairways were treated with whitewash.

It is hardly necessary to add that gas engineers should be discouraged from drawing horizontal retorts or coke ovens while enemy bombers are actually overhead, and scurfing should not be undertaken during "black-outs." Indeed, there are several gas-works operations in connexion with which one must apply during air raids that famous piece of advice once offered by Mr. Punch to those contemplating marriage—namely, "DON'T." Apart from these, however, there is nothing to prevent the actual manufacturing processes being continued during "black-outs," provided certain natural precautions are taken. One of these is, of course, suitable attention to chimneys which have a habit of belching forth flames at odd times.

To return to Leicester, the lamps which illuminate the various gauges in the exhauster house were screened, as also were the steam boilers and indicators, while the warning lamps on the electrical generating sets were hooded. To facilitate the movements of personnel and emergency vehicles about the works yards, kerb stones were whitewashed, as well as the corners of buildings and other obstructions.

Safeguarding the Distribution System.

From the foregoing it will be appreciated that the effective "blacking-out" of his works is one of the least difficult jobs which the gas engineer has to tackle in connection with air raid precautions. But the obligations of the gas undertaking extend beyond the works. The entire district must be considered from the viewpoint of safety measures in the event of air attack.

At Leicester, Mr. Mitchell has prepared a scheme whereby the whole distribution system is divided up into twelve distinct areas—any one of which can be quickly isolated in case of fire without interrupting the supply to the remainder. This, it is proposed, will be carried out by means of a number of isolating valves or, where this is deemed too costly, by boring the mains and plugging the holes in readiness for bagging off. The scheme further provides for the cutting and capping of various of the smaller mains intersecting the different sections, so that the number of isolating valves is considerably reduced. It is estimated that the cost of this scheme to the Leicester Gas Department will be somewhere in the region of £4,500; but for all that, such measures are essential if the safety of large cities is to be considered.

To deal with fires, &c., emergency gangs have been organized—three at each of the principal centres—at the Aylestone Road Gas-Works, at the Belgrave Gate Works, and at the Central Offices in the city. These gangs, each of which has its own emergency vehicle, consist of a foreman and six men, all of whom have been instructed in the use of gas masks and gas-proof uniforms. The vehicles are, of course, provided with the special lamp screens to which reference has already been made, while the lighting units which are used for road breaking and repair work are also suitably shielded. The special equipment required for these nine gangs is estimated at about £700. The Department have also made arrangements for sufficient transport to be available not only for the rapid movement of gangs and equipment to the scene of operations, but also for the maintenance of communications between the central control and the works in the event of telephonic communications being dislocated.

Training Personnel.

The Gas Department at Leicester, along with the other municipal undertakings, have taken active steps in regard to

the proper instruction of their staff in air raid precautions, and already the majority of the works and district staff are numbered among the 1,500 Corporation employees who have undergone a training course. An instructor in anti-gas measures has been appointed, and after training at the Civilian Anti-Gas School he will be responsible for the instruction of the de-contamination squads for the purpose of dealing with any buildings, plant, and other materials which may become contaminated by poison gas. For this purpose a special class-room has been set apart at the gas-works for instruction purposes, and here the proper method of gas-proofing a room is demonstrated. Every member of the works and fitting staff goes through this course of training in classes of a dozen from each section in turn.

The Department have a private fire brigade at the Aylestone Road Works, which can be quickly mobilized to deal with outbreaks of fire on the Department's premises; arrangements have, in addition, been made for the provision of splinter and gas-proof shelters for the protection of the works personnel. Mr. Mitchell also stresses the need for co-operation between neighbouring gas undertakings, so that it may be possible to exchange material and personnel between the undertakings in the event of serious dislocation of gas supplies in any one area.

Any scheme of air raid precautions to be fully effective must include the provision of a series of de-contamination centres throughout the area. In this connection proposals have been made for the conversion of a disused retort house at the Aylestone Road Works into an up-to-date centre of this kind. The situation is most suitable in so far as the walls of the building are several feet in thickness; it is flanked on one side by a railway embankment, while some 18 ft. of coal is stored overhead. Such a building is regarded as being as nearly bomb-proof as possible, and ideal for housing the usual air-locks, lead-floored undressing room, shower baths, dressing room, stores, mess-room, and first-aid department. To cater for a de-contamination squad of seventy men it would cost some £3,000.

Public Lighting.

The important subject of public lighting so far as it affects a gas undertaking must essentially be treated according to the system which any particular undertaking has in operation. Where street lighting is supplied from separate mains, as, for example, with high-pressure lighting, rapid extinguishing is a comparatively simple matter. Where individually controlled units are in operation, however, the gas undertaking must be prepared to despatch an emergency staff to put out the lights. In Leicester all the public lighting—both gas and electricity—comes under the jurisdiction of the City Lighting Engineer, so that the Gas Department were not required to take any steps in connexion with this part of the "black-out." For this particular experiment, we understand that clock-controlled lamps were re-set to extinguish themselves at the appointed time, while the remainder were put out by hand. All five thousand or so gas lamps were well and truly out at the commencement of the "black-out."

We have now covered fairly fully all the measures which the Leicester Gas Department adopted or propose to adopt to render their contribution to air raid precautions as complete and effective as possible. Much still remains to be done—particularly on the district—but the Department are to be heartily congratulated in having formulated at any rate a provisional scheme which can well form a basis for general discussion. So far as the "blacking-out" of the gas-works was concerned, we can state unreservedly from our own observations that the steps taken were entirely effective. Whatever Mr. Geoffrey Lloyd and his co-observers saw of Leicester from the air we are sure it was not the gas-works.

FACILITATING TRAFFIC MOVEMENT.

Now for a few impressions of the "black-out" itself as viewed from one of the patrol vehicles. As to the various methods of treating the streets with a view to facilitating the movement of traffic, the observers had to decide which of the following systems appeared to them most effective in the dimmed light from their headlamps: Reflectors set at varying intervals in the sides of the kerb-stones; similar reflectors in conjunction with one or other of the following methods of painting the kerbs and roadways: continuous white painting of the kerbs, alternate black and white painting for varying lengths, white strips at intervals, a continuous line along the centre of the road, whitening of trees and standards for a height of 3 ft., alternate black and white horizontal bands or a single vertical white strip on trees and standards, together with various combinations of two or more of these methods without reflectors. All traffic lights, which had to be strictly observed by drivers of the patrol cars, were severely hooded, these being visible in the ordinary way at 10,000 ft. from the ground. Street bollard lights were screened and reduced in intensity.

The type of screens provided for the vehicle lamps, it may be mentioned, were specially designed by the Home Office. For tail lamps, the white section illuminating the number plate is completely blanked off, only the red light being visible. For side lamps a small leather hood, with dark blue aperture, fits over the bracket by means of an elastic band. A more elaborate contrivance is provided for headlamps, for it is by the light from these that vehicles are expected to drive under air-raid conditions; the side lights are quite useless save for indicating the width of approaching vehicles. In principle the headlamp screen is similar to the discs which many motorists use in times of fog, fitting over the lamps by means of a leather and elastic "grip". In this case, however, the yellow-tinted disc is replaced by black metal, eliminating the whole of the light save for a narrow horizontal ground glass strip let into the upper hemisphere. Above this strip, in the form of a downwardly sloping "peak" some 8 in. in length, with suitable side pieces, is a reflector which diffuses the light on to the surface of the road about a dozen feet in front of the vehicle.

The Patrols Sally Forth.

For the purpose of the Leicester experiment, the streets on the seven-mile route were divided up into eighteen sections, treated in the various ways to which we have referred. At midnight we were moving off to our appointed stations at specified points along the route. Already the City was assuming an unaccustomed blackness as the public and private lights were extinguished. The inhabitants responded splendidly, and only an occasional dim light from behind drawn blinds could be detected—nothing at all visible from above so far as we could judge from the ground. Beside each driver was an observer, armed with pencil, torch, and observation sheets on which he was required to set out the times taken to cover the various sections and his opinions of the visibility provided by the different methods of treating the roads. On the tick of 12.30 we set off on our patrol. Zero Hour was 1 a.m. The "air raid" was on.

It seemed at first as if we had been suddenly plunged into Stygian darkness. Indeed, for the first few hundred yards it seemed as if our lamps had been so effectively screened that no light was being emitted at all. Very soon, however, our eyes became accustomed to the new conditions, and we began to pick up the white strips and reflectors by the roadside with greater facility. Our driver knew the route well, and we travelled along at a steady speed, little hindered by other patrols. The only break in the utter darkness of the streets was one brilliantly flashing green advertisement sign which a tradesman had overlooked. This, it appeared, was subsequently switched off. We covered the first circuit in a fraction over the half-hour—and immediately set off again in the reverse direction.

This time the traffic conditions were more difficult, for the various patrols which had been well spaced on the first circuit became bunched together at intervals, which considerably slowed up our movements. A hundred vehicles distributed over seven miles of route should give—theoretically—one vehicle every 130 or so yards. And assuming that half the vehicles are travelling in the opposite direction, this should allow—again theoretically—the seemingly ample margin of little short of 300 yd. per vehicle. For all this, however, the route appeared on our subsequent circuits to be unpleasantly reminiscent of the Brighton Road on a Bank Holiday evening—and much of it was nothing like as wide, with many more right-angle bends! Nevertheless, in spite of occasionally becoming unwillingly attached to what appeared to be a convoy of refuse collectors or a fleet of shrouded motor 'buses, we

managed to cover the second circuit in only a few minutes longer than the time taken for the first.

Overhead we caught an occasional glimpse of the lights of the R.A.F. bombers circling around the city, the roar of their engines faintly audible above the traffic. Vaguely we wondered if they could see us. A few spectators sacrificed their sleep to view the unusual sight of a hundred vehicles creeping about the streets of a darkened city. Ghost-like tramcars, their interiors illuminated only by a dim blue light, flitted up and down the main street. Every now and again an ambulance or fire engine would overtake us, adding a note of reality to the scene. Special constables gave us vocal directions at danger points. Silently the traffic light turned from red to green and back to red again as the patrols crossed and re-crossed the route.

Then it began to drizzle. This, if anything, slightly improved the visibility on the ground by reason of the increased reflection on the wet surface of the roads. On the other hand, it almost completely eliminated the central white line, against which section we therefore debited a black mark, realizing that dry weather could not always be relied upon for air raids. The clouds remained high, and the bombers were still visible at intervals overhead. We subsequently learnt that what appeared to us to be a considerable amount of light on the shiny surface of the roads reflected nothing of significance to the airmen above us. After three complete circuits of the route we returned to our original stations to compare notes and exchange impressions of the advantages of the different methods of treating the roads.

At last came 3 a.m. and the "All Clear." Our driver switched on normal headlights once again, and in what seemed like a veritable blaze of glorious light we returned to headquarters at the Fire Station. Here we assembled in the Lancaster Hall for some welcome refreshment and a few words from Wing-Commander Hodsoll who had been observing with us on the ground. He congratulated Leicester on a magnificent effort and paid a well-merited tribute to Mr. A. T. Gooseman, M.Inst.C.E. (City Surveyor), Mr. A. S. Turner, the local A.R.P. Officer, and to the Chief Officers of the city for the enormous amount of work they had put in.

Summarizing Impressions.

Save for the one exception to which we have referred, the darkness so far as we could guess its visibility from enemy aircraft was complete. It is reported that the undimmed lights of the Railway Station and locomotive yard assisted the airmen to identify the city. We cannot speak for the locomotive yard because we did not see it; but the L.M.S. passenger station most certainly had its lights dimmed so far as could be seen from the road during the first circuit, while they appeared to have been extinguished altogether on the subsequent patrols.

There is no doubt that the experiment established that only complete darkness can afford any measure of protection to a town during an air raid, and that the mere masking or dimming of street lamps is insufficient in itself. It also proved that a considerable volume of traffic can be kept moving through the darkened streets at an average speed of up to nearly 15 m.p.h. On the methods adopted to assist vehicles there will be less agreement; it was notable that the opinions of the drivers of private cars differed in many instances from those of drivers sitting in the higher driving positions of 'buses and lorries. As regards the effectiveness of the lamp screens, all one should have been able to see of an approaching vehicle, we presume, were two "pin-point" lights from the sidelamps and a subdued glow moving along the surface of the road towards one. In practice, however, while many of the vehicles did produce this effect, we found that some of the headlamp screens had been badly fitted, so that while probably not reflecting any dangerous light upwards, they definitely caused at times a certain amount of disturbing dazzle in the eyes of approaching drivers. One cannot help feeling that the running of tramcars during air raids is undesirable, for although those at Leicester were very effectively darkened so far as their interiors were concerned, there was every now and again that unavoidable tell-tale flash as the overhead trolley passed across the conductor connexions. Our own opinion of the methods of treating the roads favours the alternate black and white painted strips along the kerbs—though doubtless this is also the most expensive system to maintain. Disappointment was expressed at the reflectors—one objection being (though not one concerning their actual efficiency in use) their liability to be knocked off or broken by parking traffic.

Apart entirely from the lessons learnt from this experiment at Leicester—and the lessons concern gas undertakings just as much as the general public—it was undoubtedly a tribute to the system and the personnel that nearly three hours' continuous driving under such trying conditions was attended by not a single mishap—though we believe here and there a patrol ran off the route for a few minutes—notably one of the fire engines (though perhaps it was only practising turning round in a darkened road!) No vehicle took more than 45 minutes over the 7-mile route, and, while we have already referred to the congested conditions which prevailed at times, probably these more nearly represented the conditions which might be expected during an actual air raid. Perhaps there is something in the suggestion for maintaining certain "free routes" for emergency services.

At 4.15 a.m. we signed off and a quarter of an hour later were climbing into bed—tired but at the same time conscious of having taken part in a unique experiment of considerable National importance. The war of Jan. 28, 1938, was over—and no casualties!

Athletic and Social

Chertsey Dinner and Concert.

The staff and employees of the Chertsey Gas Consumers' Company held their annual dinner at the Constitutional Hall on Jan. 26. The company numbered about 80.

Mr. R. R. Jones presided, and supporting him were the Vicar (the Rev. C. L. Wanstall), Messrs. T. J. Riggs (Chairman of the Urban Council), J. Robertshaw (Chairman of the Chamber of Commerce), A. T. Ledger, T. L. Gadd, W. H. Portwood, W. V. Davies, F. G. Matthews (Engineer and Manager), and A. J. Saunders (Secretary).

Mr. Jones read letters from the Chairman, Sir David Milne-Watson, and Mr. G. R. Wells saying how sorry they were to miss the dinner. He then welcomed all the visitors, particularly mentioning the Vicar and Mr. Riggs, Chairman of the Council. Dinner over, Mr. Jones submitted the Loyal Toast, following which Mr. F. Browne gave "Health and Prosperity to the Company.

Replying, Mr. Jones said for the year ended Sept. 30 last the amount of gas sold by the Company was 156,562,700 cu.ft. In the same period there were 530 new consumers, due chiefly to the large number of properties which had been built in New Haw, Woodham, and Chertsey.

Welcoming the visitors, Mr. Matthews said he had had that privilege for 13 years, and on that occasion his welcome was no less hearty and sincere.

Women's Gas Council

Birmingham Branch Visit Bournville.

At the invitation of Messrs. Cadbury Brothers, 600 members of the Birmingham Women's Gas Circle visited Bournville Works on Jan. 20, where they were welcomed by Miss Dorothy Cadbury.

During a tour of the works they were shown miniature models of machinery, and witnessed the making of tins, which they subsequently saw being filled with cocoa. Members then visited the room where every egg used in the manufacture of Bourn-Vita is cracked and tested; also the cardboard box department, where the making and covering of boxes was demonstrated. Much interest was shown in the decoration of Easter eggs, and in various other processes.

After an hour's tour of the works, the visitors were pleased to rest in the Concert Hall and watch Miss M. Cox demonstrate, in a most efficient manner, dishes made from Bournville Cocoa, Cup Chocolate, Bourn-Vita, &c., on modern gas cookers.

The party was accompanied by Councillor A. S. Giles (Chairman of the Birmingham Gas Committee) and Mrs. Giles; Mr. A. W. Smith (General Manager and Secretary of the Gas Department) and Mrs. Smith; Mr. G. M. Lewis (Controller of Gas Sales), and Miss O. L. Humphries (Organizer).

The visit proved most interesting and enjoyable, and at the close of the proceedings a vote of thanks to Messrs. Cadbury Brothers was proposed by Councillor Giles and seconded by Mrs. J. A. Froggatt. Miss Dorothy Cadbury responded.

Gas Light and Coke Company Accounts

The Effect of Increased Costs

As was to be expected, the accounts for the year 1937, which are to be submitted at the Annual General Meeting next Friday, reflect in more than one direction the effect of increased costs, and show the need for at any rate a partial off-set by the small increase in the price of gas which was recently announced. But this is only one view of the picture, because on the other side of the accounts a modest increase in gas sales and larger returns from residuals have added substantially to the Company's receipts.

The Gas Light and Coke Company, like so many other of our leading commercial undertakings, found in 1936 a very good business year, and one which might have been regarded as a little difficult to "live up to" in 1937. It is the habit with the Gas Industry to set itself fresh records to break; and the records of 1936 were substantial. There is thus cause for satisfaction that the sale of gas by the Company during 1937 (excluding bulk supplies) showed an increase of 1·32% over that of the previous year. Other encouraging facts are that there has been an addition for the year of 38,319 to the number of the Company's consumers, and a net issue of 274,773 appliances sold and let on hire or hire-purchase. While the increase in the number of consumers is not quite so great as it was in the previous year, when the figure was 41,166, the net issue of appliances is nearly 60,000 more, and has now well passed the quarter-of-a-million mark in a twelve monthly period.

After the payment of the dividends for the June half-year, and after contributing the sum of £20,000 to the Redemption Fund, and the sum due to the co-partners for the year under the provisions of the Company's Act of 1931, there is a total available balance of £851,790, out of which the Directors recommend the payment of dividends at the same rate as for the previous year—namely, 4% per annum on the consolidated preference stock, 3½% on the maximum stock, and £5 12s.% on the ordinary stock. Also 3¼% on the new redeemable preference stock, 1970. This distribution, together with the further sum of £20,000 to be contributed to the Redemption Fund, will absorb £749,414, and leave £102,376 to be carried forward to the credit of the current year. A year ago the carry forward was £213,177, but in the distribution on the present occasion there falls to be included the dividend on the £2,993,000 new 3¼% preference stock, amounting to £112,238, which almost exactly accounts for the drop in the carry forward.

Bigger business has naturally called for expenditure on the distribution side, and there was an outlay during the year of £203,604 on mains and service pipes, of £372,583 on meters, and of £719,675 on stoves. Other capital expenditure was small.

The Revenue Account.

Turning now to the various figures relating to the year's trading, it appears that among the main differences in 1937, when compared with 1936, are the following: Coal, including all expenses thereon, cost £221,267 more; coke, &c., used in the manufacture of water gas, £16,662 more; carbonizing wages, £11,269 more; and repair and maintenance of works and plant, £262,224 more. Repairs, maintenance, and renewals on the distribution side are also up. It is pointed out that the total wages paid by the Company for the year 1937 amounted to £3,703,454 (or £123,000 more than in the previous year), while the total salaries paid over the same period were about £63,000 up at £1,133,046.

On the other side of the Revenue Account, coke and other residual products make a good showing, and, of course, more was received for the larger quantity of gas sold. Sales of gas by meter at 8·7d. per therm (higher prices, authorized by the Company's Acts, have been charged in certain outer areas), and special contracts, including sundry processes, produced £98,196 more, at £8,589,427, and there is the customary rise in the receipts from public lighting—on this occasion the gain is some £2,400, to the very substantial total of £236,147, which represents a quite important section of the Company's business. All receipts for residuals with the exception of ammoniacal liquor and sulphate of ammonia, are well up on the year, coke leading the way with a gain of £278,719, at £2,135,577.

It will be seen from the expenditure figures in the accompanying table that distribution of gas cost £147,775 more. There is also an additional amount for co-partnership, while annuities and contributions to superannuation fund called for £46,322 more, at £301,781. Expenses *re* issue of stock on this occasion are negligible compared with a charge of £59,327 in 1936. Rates and taxes, too, are very considerably down, a drop of no less than £89,000 in 1937 following upon a reduction of over £40,000 a year ago. The largest increase under the heading of management is for general charges, which are some £26,000 up. Rentals of meters and stoves are substantially higher, but rentals of fittings (automatic supplies) are somewhat less than a year ago.

While the total receipts on Revenue Account are up by £537,792, the year's expenditure amounted to £580,635 more, thus leaving the gross profit down by £42,843. This is entirely met by the reduction in the amount required for interest on temporary loans.

Figures in the Balance Sheet.

On one side of the Balance Sheet the principal alterations, as compared with a year ago, are an increase in the balance at credit of Capital Account from £263,418 to £2,706,492, and the addition of a temporary loan from bankers of £550,000. At the same time cash at bank and in the Company's hands has come down from £436,897 to £258,996, while on the other hand there is an addition of more than £100,000 to the value of stores on hand. Variations in the figures on this side of the Balance Sheet, as compared with twelve months ago, are, however, mainly in the item (under sundry debtors and debit balance) of "Sundry Appliances, &c. (Deferred Payments)," which has increased from £3,386,705 in 1936 to £4,751,595 in the present accounts. In 1935 the figure was no more than £1,970,183. This rapid growth of the hiring-out system is undoubtedly to the benefit of both Company and consumers, but its effect upon the figures must be borne in mind when considering the accounts. It is a modern development with which progressive gas undertakings have to reckon. One other striking item in the Balance Sheet is an increase in the amount invested in Allied Undertakings from £494,208 to £563,874, which is just one more indication of the modern trend.

Comparison of the Revenue Account for the Two Years 1937 *and* 1936.

EXPENDITURE.

	1937.	1936.
	£	£
Manufacture of gas	5,919,439	5,418,432
Deduct revenue from residuals	2,777,245	2,410,630
Net cost of gas making	3,142,194	3,007,802
Distribution of gas	3,816,699	3,668,924
Public lamps, lighting, and repairing	143,048	148,328
Rents, rates, and taxes	576,904	662,509
Management	511,713	470,757
Co-partnership	124,876	122,404
Annuities and superannuation	301,781	255,459
Expenses *re* issue of stock	339	59,327
Other miscellaneous charges	128,436	136,460
	£8,745,990	£8,531,970

RECEIPTS.

	1937.	1936.
	£	£
Gas rental	8,825,574	8,725,012
Meter ,,	442,344	427,510
Stove ,,	995,549	938,981
Fittings,,	458,670	463,343
Miscellaneous receipts	74,027	70,144
	£10,722,137	£10,624,988
Gross profit	£2,050,174	£2,093,017

Coal and Gas Oil Used.

	1937.	1936.
Coal carbonized, tons	3,407,937	3,325,285
Gas oil used, galls.	8,157,725	8,096,904

Gas Made—Therms

	1937.	1936.
Coal gas (including purchased)	260,996,362	255,650,950
Carburetted water gas	25,754,918	24,530,596
Total	286,751,280	280,181,546

Statement of Gas Sales, Gas Used and Gas Not Accounted for.

	1937.	1936.
	Therms.	Therms.
Gas sold, consumer sales	249,274,721	245,465,936
Sundry processes	14,808,242	14,096,166
Correction for temperature, &c.	6,896,957	6,647,986
Total	270,979,920	266,210,088
Gas used	5,187,964	1,872,967
Quantity not accounted for	10,583,396	12,098,491

Conjoint Conference

of Public Utility Undertakings

Many matters dealt with in the Annual Report, Jan., 1937, to Jan., 1938, have been commented upon in the "JOURNAL" as they occurred. The Report as a whole, however, furnishes a valuable summary of results achieved, or still to be hoped for, from joint action by the public utilities of the country, in cases where their interests, and consequently those of the great majority of citizens, have been common.

Since the last Annual Meeting of the Conference held on Jan. 28, 1937, there have been three meetings of the Council, and during the same period the following Committees, appointed by the Council at its first meeting, have met, in some cases on several occasions: Executive Committee, Finance Committee, Coal Committee, Rating and Valuation Committee, Mains and Cables in Highways Committee, and Parliamentary Committee.

Numerous interviews have taken place with representatives of Government Departments in connexion with pending legislation and other matters.

A meeting of the Joint Negotiating Committee composed of representatives of the Highway Associations and of the Conference was held on April 30, 1937, for the purpose of further discussing the question of mains and cables in highways.

A formal Deputation composed of representatives of the Conference waited on the Minister of Mines in connexion with the coal situation. Recently Colonel Ogilvie and others representing the interests of coal consumers attended a meeting of Members of Parliament, supporters of the Government, and urged the necessity for additional safeguards.

The work of the Conference and its Committees during the year has been extremely heavy. In particular, the coal situation demanded the closest care and attention, necessitating six long meetings of the Coal Committee, negotiations with other bodies objecting to Part III. of the Coal Mines Bill, and a very large amount of correspondence. In addition, a considerable number of matters of importance to individual members but not mentioned in this Report were dealt with by the Joint Honorary Secretaries.

Numerous measures which have been passed during the year, or were or are at present before Parliament, have engaged the attention of the Conference, and in most cases have been the subject of representations to the Departments concerned.

Factories Act, 1937.

The Conference had no reason to find fault with the provisions of the Bill in general, but pointed out to the Home Office that the definitions of the words "factory," "building operation," and "work of engineering construction" might be wide enough to include work carried out by a public utility undertaking upon the premises of a consumer, or work carried out in the highway in connection with the laying, repairing, or renewing of sub-surface work. The Home Office, however, took the view that the fears of the Conference were groundless, and gave assurances to that effect. A subsequent attempt made when the Bill was in Committee, to have the definitions amended in such a way as to remove all ambiguity was unsuccessful. Both the gas and electricity interests were, however, able to secure minor amendments in regard to provisions affecting them individually.

Arbitration Bill.

This Bill was considered by the Executive Committee, but no action was taken in regard to it. It sought to render void any provision in an agreement the effect of which would be to provide that disputes arising under the agreement should be sent to the arbitration of one of the parties to the agreement, or a person in the employ of one of the parties. It was, however, subsequently dropped by its promoters.

Finance Act, 1937.

National Defence Contribution.—That part of the Bill which provided for the National Defence Contribution in its revised form, while granting exemption from the tax to public utility undertakers whose prices or dividends were regulated by enactment, raised certain doubts. In consequence, an amendment, which was accepted by the Chancellor of the Exchequer, was put down for the purpose of ensuring that the exemption should extend to basic price gas companies where the statute regulates not the rate of dividend payable, but the amount of money which may be contributed.

Duty on Tower Wagons.—Another amendment in the form of a new clause having the effect of reducing the duty on tower wagons (used for the purpose of an electricity undertaking, gas undertaking, or electric transport undertaking) was accepted, as was a further new clause under which all moneys received by a holding company from subsidiary public utilities—whether by way of dividends or fees for management, &c.—are exempted from the tax.

Depreciation Allowance in Respect of Buildings.—The Act repeals Section 18 of the Finance Act, 1919, and substitutes for it new provisions in regard to the depreciation of buildings. Under the new provisions, an allowance is granted of an amount equal to 1% of the actual cost to the person carrying on the trade, of any building which forms part of the premises and contains, and is used wholly or mainly for the purpose of operating, machinery worked by steam, electricity, or other mechanical power, or a building the depreciation of which is substantially increased by the operation of such machinery.

After consultations with the Inland Revenue Authorities, it was considered that the allowance which could be claimed under the new provisions would not be less than that which had been allowed by the Inland Revenue under the 1919 Act, and it was therefore decided, subject to certain assurances which were obtained from the Inland Revenue, that no opposition should be offered to the new proposals of the Government.

Staffordshire County Council Act.

Though the Bill contained provisions with regard to the stopping up and diversion of county roads, and the stopping up of level crossings, it provided no protective clause for public utility undertakers, and the Conference, having failed to secure by negotiation with the promoters a suitable clause, reserved the right to petition against the Bill in the Second House. In the meantime, certain local authorities in the county lodged a petition in the First House, and obtained—with the assistance of the Conference—the incorporation of an excellent protective clause. The clause in effect provides that where the execution of the work authorized by the Bill renders it reasonably necessary to do so, public utility undertakers may remove their mains, cables, or pipes at the expense of the County Council.

The clause forms a valuable precedent dealing as it does with the principal issue now being discussed in the Negotiating Committee with the Highway Authorities.

Coal Mines Bill.

Though the Bill now before Parliament was not introduced until the latter part of the year under review, the action of the Conference in regard to the coal position may be conveniently dealt with under this head, more especially as the Coal Committee's chief efforts were continuously directed towards ensuring that the expected legislation should afford better protection to coal consumers against the coal selling monopolies set up by the revised District Schemes.

A year ago the position was that the Conference had secured from the Mines Department a promise that in the forthcoming legislation provision would be made for strengthening the Committees of Investigation. It was hoped, too, that by the operation of Joint Consultative Committees, representative of coal and public utility interests which the

Central Coal Council had agreed to set up and which were then in course of formation, the position of consumers would be eased.

This hope was not, however, realized. The operation of the Selling Schemes became steadily more and more unsatisfactory from the consumers' point of view. Prices were raised, in many cases steeply, difficulties in securing the desired qualities of coal were experienced, and there were cases of discrimination as between public utility consumers and others.

Members of the Conference appealed to the Committees of Investigation in their districts, but in vain. In no case was satisfaction obtained. Information put before the Committees by the coalowners with regard to prices was supplied strictly in confidence, and was denied to the appellants, who had therefore no means of ascertaining whether or not the prices complained of could be justified. Except in a few isolated instances the Joint Consultative Committees also proved useless. The representatives of the coalowners refused to discuss the question of price, and in some Districts even refused to set up any joint committee.

In these circumstances it was decided by the Coal Committe, and approved by the Council, that the Mines Department should be informed that a further trial had been given to the Committees of Investigation and to the Joint Consultative Committees, and that it had been found that both of them were quite inadequate to give the reasonable protection required by public utilities to ensure that they were not paying an unfair price for coal, that there was no undue preference, and that requisite safeguards were provided.

Correspondence between the Joint Secretaries and the Mines Department followed, in the course of which it appeared that the latter were endeavouring to place upon the shoulders of the Conference the responsibility for "submitting constructive proposals with the object of securing that measure of protection to consumers which they consider desirable."

While the Coal Committee felt that the responsibility for safeguarding the interests of consumers should be undertaken by the Government, they none the less drew up detailed recommendations for the amendment of the existing law with that aim in view. These were embodied in a letter sent to the Mines Department on Sept. 9, and included proposals to the following effect:

(1) That an Independent Supervisory Body, advisory in character and without executive powers, should be set up for the purpose of safeguarding the public interests and fostering efficiency within the coal industry; that, *inter alia,* it should be placed in a position to give definite advice to the Board of Trade with regard to all matters pertaining to the production, distribution, and sale of coal, including such matters as the general price level of coals and discrimination in prices.

(2) That the District Selling Organization should be under a statutory obligation to supply coal of the quality reasonably required by the consumer.

(3) That the District Selling Organization should be under a statutory obligation to show no undue preference to any consumer or class of consumer.

(4) That the representatives of large users of coal should have access to the prices at which different classes of coal are sold to different classes of consumer.

(5) That Committees of Investigation should be reconstituted and the existing procedure amended as follows: The Committees should consist of independent persons and not be representative of sectional interests; meetings of the Committees should be held in public; complainants should have the same full access to information as the Committees; and there should be a right of appeal to a Central Tribunal.

These proposals were further explained and emphasized by a Deputation of the Conference which waited upon the Minister and Officials of the Mines Department on Sept. 30, 1937. On that occasion the Minister rejected the proposal in regard to the setting-up of an Advisory Body, but was noncommittal in regard to the others.

Soon thereafter the long-awaited Bill was introduced, and it was found that while some of the proposals of the Conference in regard to the Committees of Investigation had been incorporated in Schedule VIII., those relating to the creation of an Advisory Body, and other proposed safeguards, had been omitted. It was found, too, that the Title of the Bill had been so narrowly drawn that it would be difficult, if not impossible, to put down any amendments other than those relating to a Committee of Investigation.

The Coal Committee, having fully discussed the new position, recommended first that the amendments to the Bill necessary to give effect to those of their proposals which the Mines Department had not accepted should be put forward for the information of the Members of the House of Commons, even though they might subsequently be ruled out of order; and secondly, that the Government should be asked to limit the period of extension of Part I. of the Coal Mines Act of 1930 to one year, or a time no longer than was necessary for them to consider the provisions of an Amending Act in the consumers' interests. These recommendations have been approved by the Council and will be carried out.

While the Conference was conducting negotiations with the Mines Department it was also in consultation with various other organizations, more or less directly representative of consumers, before which its views on the situation were placed. The result has been that support of the Association of Municipal Corporations, the Chambers of Commerce, the Chamber of Shipping, and many other bodies has been obtained, and representatives of many of them co-operated with the Conference in placing before the meeting of Members of the House of Commons, to which reference has already been made, the grievances of all classes of consumers, and giving voice to the anxiety in regard to the rise in coal prices which is being increasingly felt in all parts of the country.

Matters Arising Out of Other Parts of the Coal Bill.—Steps are being taken to safeguard the interests of public utility undertakings with regard to the reservation of minerals under land occupied by public utilities for their various works, and with regard to rights of support.

Air-Raid Precautions Act.

This Act relates to local authorities upon whom it places the obligation to submit schemes with regard to the precautions to be taken in the event of hostile air attacks. After the Act had been passed, the Home Secretary announced (in answer to a Question put at the instance of the Water Associations by Sir William Davison, M.P.) that "the Government have been considering the position of certain essential public utility services, the continued functioning of which is essential in war-time. The exceptional position of the industries concerned places upon them a special responsibility for doing their utmost to ensure continuity of service in all circumstances, including those of war. These industries will have to incur considerable expenditure on the measures necessary to ensure continued functioning in war-time; and the Government have accepted the principle of a contribution towards expenditure of this nature on precautions additional to those falling on industry generally. The actual details of any such arrangement must be worked out in close consultation with the undertakings concerned. These consultations will begin as early as practicable in the New Year." So far no such consultations have been initiated.

Exemption from Compulsory Purchase.—As a result of representations made on behalf of the Conference, not only are the lands of statutory public utility undertakers in England exempt from the right of compulsory purchase conferred on local authorities for the purpose of air-raid precautions schemes, but a similar exemption has been conferred upon both statutory and non-statutory public utility undertakings in Scotland.

Common-form Saving Clauses.—In this connexion it may be mentioned that the Conference, at the instance of Mr. Herbert Williams, M.P., is drawing the special attention of the Government to the importance of including in Bills when being drafted the protective provisions established by precedent.

Hire-Purchase Bill.

This is a Private Member's Bill which seeks to remove certain abuses in the hire-purchase system. It is supported by all Parties in the House of Commons, and has the approval of the reputable hire-purchase companies, so that it may

reach the Statute Book. In some respects its provisions would be prejudicial to public utility undertakers which use the system incidentally in their business, and arrangements are being made to meet the promoters with a view, if possible, to securing the exemption of such undertakings from the scope of the Bill.

Rating and Valuation.

It has already been reported that at the deputation to the Central Valuation Committee on March 20, 1936, the suggestion was made that as some of the proposals of the Conjoint Conference would involve legislation, steps should be taken to ascertain how far the rating authorities were prepared to support these proposals. With this object in view, therefore, the memorandum which the Conjoint Conference had submitted to the Ministry of Health and the Central Valuation Committee was sent to the Association of Municipal Corporations and placed by that Association before their Rating Committee.

Unfortunately, this Committee decided that "sufficient time had not elapsed to enable the procedure suggested by the Central Valuation Committee for the valuation of public utility undertakings which extended into two or more rating areas to be generally adopted by rating authorities throughout the country, and that in view thereof they do not think that any useful purpose would be served by a meeting at the present time between representatives of the Association and of the Conjoint Conference of Public Utility Associations."

It was therefore decided that the attitude of the rating authorities should be reported to the Central Valuation Committee, and that that Committee should be asked to state whether they proposed to take any further action in the matter.

The Conference pointed out that unless the Central Valuation Committee were prepared to take some further steps, it would be necessary for the Conference to make representations to the Ministry of Health.

During the year reports have been received from all parts of the country that certain rating authorities were endeavouring to review assessments during the quinquennial period and were endeavouring to obtain information from undertakers upon which they hoped to be able to base a proposal for the amendment of the valuation fixed at the beginning of the quinquennium.

In this regard a special meeting was held with representatives of the Hertford County Valuation Committee in connexion with the proposed reassessment of a certain Gas and Water Company. As a result of these consultations a proposal was made to the County Valuation Committee, the gist of which was that supplementary assessments during the quinquennium should be avoided as far as possible, but where such supplementary assessments were necessary they should not involve any review of the cumulo.

No reply to this suggestion has been received from the County Valuation Committee, and there is evidence that the practice of interfering with assessments during a quinquennial period is on the increase throughout the country. The Conference has therefore communicated with the Ministry of Health and the Central Valuation Committee on the matter, pointing out that the recommendations of the Central Valuation Committee in this regard have been largely ignored by rating authorities, and the Minister has been asked to receive a small deputation to discuss this question.

A solution of this difficulty is perhaps foreshadowed by a statement which appeared in *The Times* of Jan. 3, 1938, referring to a Joint Memorandum prepared by the Council of the Chartered Surveyors' Institution and the Committee of the Rating Surveyors' Association which has been submitted to the Central Valuation Committee, with a request that they should consider the advisability of suggesting a reform in the law with respect to appeals in rating cases. As regards public utility undertakings, the Joint Memorandum submits alternative suggestions—arbitration, and a peripatetic tribunal of rating experts to hear appeals in the rating areas concerned.

Land Drainage.

It has already been reported that certain difficulties have arisen as to the basis upon which public utility undertakings shall be assessed for the purpose of the drainage rate under the Land Drainage Act, 1930. On this subject the Conjoint Conference has been in negotiation with the Catchment Boards' Association, but unfortunately it has not been found possible to arrive at any satisfactory agreement.

At the end of the year a new Association representing Internal Drainage Boards was constituted, and the Conference is hoping to open negotiations with this Association with regard to the matter. Meanwhile, it has been ascertained that the Government propose in the near future to introduce a new Land Drainage Bill, and the Conference has already been in communication with the Ministry of Agriculture and Fisheries and has suggested to them that the opportunity should be taken to place on a satisfactory basis the question of the assessment of public utility undertakings to the drainage rate.

Mains and Cables in Highways.

The Committee have met twice during the year and, as already reported, there was a meeting of the Joint Negotiating Committee. At these meetings the draft agreement was further discussed, with particular reference to the suggestion that the whole of the costs of altering mains and lines, consequent upon an alteration of the highway, should be borne by the highway authorities. The position at present is that the Highway Associations are obtaining further information as to how far the various classes of highway authorities throughout the country would be able to meet the financial obligations which would be imposed upon them by the clause which was the subject of discussion.

A further complication has arisen owing to the Trunk Roads Act, 1936, which constituted the Minister of Transport the Highway Authority in respect of certain arterial roadways known as trunk roads.

The question has arisen as to the liability of the Ministry to pay for such removal of sub-surface works as might be rendered reasonably necessary owing to the reconstruction of the trunk roads. Certain discussions have taken place with the Ministry on this matter, but no satisfactory solution to the problem has at present been reached.

The appointment by the Government of an expert Committee to consider the codification of the highway law should tend to ease the situation. A valuable Memorandum entitled "Lowering Level of Highways: Effect on Mains and Cables," appearing in the Official Circular of the British Waterworks Association for December, 1937, indicates clearly the chaotic condition of the law on this subject.

Summary Jurisdiction Act, 1848.

At the request of the water interests the Conference is taking up with the Home Office the question of revision of the Act. The Act provides (Section 11) that any proceedings to recover fines or penalties before the Justices must, unless otherwise provided by Special Act, be brought within six calendar months from the time when the matter of such complaint or information arose. This provision has proved most inconvenient to Water Undertakings as they are frequently unable to detect offences in connection with water supply within six months from the time of commission, and it is desired to alter the law so that prosecution may take place within six months of the date of discovery of the offence.

Joint Honorary Secretaries.

The best thanks of the Conference are due to Colonel Sholto Ogilvie and Mr. G. P. Warner Terry for their vigilance and for their conscientious work, which has been of the greatest assistance to the Conference.

For Offices and Showrooms, the Cupar Gas Company have purchased a property known as Marathon House, Bonnygate. The Company are at present in temporary quarters.

It Was Decided to Oppose the Sheffield Gas Company's Bill at a meeting of the Derbyshire County Council on Jan. 26. The Bill provides for the extension of the Company's coke oven gas limits to include Staveley, Clowne, and so much of the Rural District of Chesterfield as is not within the existing coke oven gas limits or limits within which the Chesterfield Corporation are authorized to supply gas.

Choice of Gas Storage - - - - - - -

From a Paper read at a meeting of the Yorkshire Junior Gas Association held at Leeds on Jan. 15—the PRESIDENT (Mr. J. Richmond, of York) in the chair.

by
W. S. HUBBARD, A.M.C.T., A.M.I.M.E.,
of the Leeds Gas Department.

The cost of a tank for a wet sealed holder forms a large proportion of the total expenditure, and may in the case of a brick or concrete tank be more than the holder itself. This will depend on whether a spiral or a column guided holder is to be inserted.

One of the most unfortunate factors about wet sealed holders in flat-bottomed tanks is the unnecessarily large amount of water employed for sealing. In the case of an 8 million wet sealed holder, the quantity of water in the flat-bottomed tank would amount to some 60,000 tons. Annular construction would reduce this to about 9,000 tons. Water is certainly cheap, but the difference in time in handling 50,000 tons of water every time an inspection has to be made may be very inconvenient and costly. The extra expense of building an annular steel tank is worthy of consideration, but the dangers resulting from the emptying of the inner water before the annular should be observed.

Steel Tanks.

The advantages of steel tanks over concrete or brick are:

(*a*) Their initial cost is invariably less.
(*b*) Erection is speedier and permits the contractors to carry out their works and site programme to schedule. In addition, this tends to keep the initial capital cost down, since the purchasing of materials may be done with a larger degree of certainty.
(*c*) The computations of the loads and stresses in the tank plating and joints are well understood by engineers and have stood the test of time.
(*d*) Bad weather conditions at site are not likely to affect the quality of workmanship during erection.
(*e*) Modern improvements in drilling, bending, riveting, and lifting machinery ensure a high standard of workmanship throughout.
(*f*) The pressure of water maintains the tank in a perfectly circular shape.
(*g*) The whole of the side plating on the outside and the bottom curb can be examined any time.
(*h*) Being an elastic form of structure, slight subsidences are not likely to affect the tank stability and tightness.
(*i*) The excavations required can be reduced to a minimum.
(*j*) The tank, being above ground, can, if required, be emptied and filled without the use of pumps.

Some of the possible disadvantages are:

1. The corrosion trouble at the water line (oil filming will tend to reduce this).
2. The difficulty of observing the condition of the bottom plating, where leakage at some of the joints may be difficult to find or repair.
3. Higher painting costs.
4. In the case of unsupported holder crowns, there will be an increased cost due to longer lengths of steelwork being required to support the roof.
5. There is a limit to the dimensions to which they can be constructed.

Concrete Tanks.

Concrete tanks may be of two types, mass or reinforced construction, the latter being more economic in the amount of concrete used, due to the composite use of steel.

Some of the advantages of this form of tank compared with steel are:

(*a*) Larger tanks can be constructed.
(*b*) Water line corrosion is eliminated.
(*c*) A minimum quantity of water is made possible, owing to either dumpling or annular construction.
(*d*) A saving is made in the cost of an untrussed crown holder by using concrete supporting piers to the trussing.

Some of the disadvantages are:

1. The longer period required for construction may increase the erection time for a holder 100% and even longer, if the tank is not watertight on completion.
2. They are more expensive than steel.
3. A specialized knowledge of concrete design is necessary. In view of the importance of the work, only firms with practical experience of large tanks should be considered.
4. Many assumptions are made in the design.
5. The material used and the process of concreting require very careful supervision.
6. The quality of workmanship may be seriously affected and delayed by bad weather, springs, &c.
7. Concrete may be affected by soils of an acid nature, resulting in exposure and consequent fracturing of reinforcement due to corrosion.
8. Difficulties of making repairs to a ruptured wall and failure to obtain the original strength.
9. Walls may be affected by subsidence.
10. Tightness is not guaranteed unless carefully puddled on the outside and cement rendered on the inside.
11. The time taken to empty a tank below ground will be much longer than with a steel tank.
12. The necessity for deep excavations and the increase of peripheral loads due to the weight of the walls.

Brick Tanks.

The advantages of brick over concrete tanks are:

(*a*) There is less initial stress due to shrinkage.
(*b*) There is less skill required during erection.

Against these must be weighed the facts that:

1. They are more expensive to construct.
2. The brickwork is not impervious to water, and tightness is relied upon from the clay puddle backing and the cement rendering on the inside.
3. The assumptions made in designing are very uncertain—for example, the cohesive resistance of the brickwork and the support given to the tank walls from the earth backing.

The stresses set up in a brick tank wall are similar to those which operate in the circumferential rings of a cylindrical steel tank. Instead of the walls tending to overturn (as is the case with a retaining wall), slight stretching in a circumferential direction takes place.

Many formulæ have been evolved to assist in the designing of the walls, but more often than not the lessons of practical experience influence the designer.

Guide Framed Holders.

Even to-day I think it can be fairly said that the majority of gas engineers would consider the guide framed gasholder the safest and most reliable means of storing gas.

From a safe structure point of view, this is very curious. F. S. Cripps, in his book "Guide Framing of Gasholders," pointed out that since the gravity of a wet sealed holder is above the centre of buoyancy, it requires to be supported under the slightest wind pressure. The columns supply this necessary support, with the result that a holder may be considered as under a state of unstable equilibrium. In the old days, the columns opposite the direction of wind were designed to take this full load, hence their massiveness. To-day, it is customary to design the whole of the framing as one supporting unit, and it is here where many assumptions are made.

Why is the column holder so popular? Apart from the above considerations, 50% of the guide carriages (the internal

ones) once put to work are never seen, lubricated, or adjusted until a holder is thrown out of commission. A large percentage of these old holders, on which opinion is based, are never a good shape, owing to the curved dip construction, and, finally, the columns are very often out of plumb in both directions.

I venture to suggest that the reason is that, relatively speaking, the wear and tear due to the up and down movement of the holder over years of working is relatively small, so that carriage adjustment is infrequent; secondly, the effect of wind is of less magnitude than might be expected; thirdly. the superior quality of the wrought iron used in their construction has been conducive to long life.

The principal claims made for the column holder are its simple construction, automatic operation, minimum inspection, and relatively low cost of painting and maintenance.

Spiral Holders.

Responsibility for the development of the spiral holder has rested almost entirely with British engineers; it is difficult to understand why, in view of the progress made here, American and Continental engineers did not follow. The largest holder of the type in existence was built in 1922 for the Belfast Corporation; it has a capacity of 7 million cu.ft. and is in a brick tank. The Sheffield Gas Company have under construction a holder of 8 million cu.ft. capacity, which will, when finished, be the largest in the world. Larger capacities up to 12 million cu.ft. have been considered, but never developed.

Apart from some finer points in spiral holder design, such as lubricated carriages, carriages with roller bearings, and rail plate improvements, the following main advantages are claimed:

1. Compared with the column holder, the capital cost is less, due to reduction in steelwork.
2. The application of the spiral rails is a convenient method of increasing the pressure thrown.
3. The accessibility of *all* carriages allows for adjustment, easy renewals, inspection, and lubrication.
4. There is steadiness under all weather conditions.
5. They are not affected by uneven snow loading.
6. The appearance of the paintwork is substantially improved by the conveyance of rainwater down the rails.
7. There is a minimum blocking of skyline in contrast with column and piston holders.

Against these points, however, are to be balanced these facts:

1. The whole of the wear and tear is thrown on to the rails and carriages. While the carriages are easily renewed, the rails, owing to their length and arrangement, are not so conveniently replaced.
2. In the event of rails requiring renewal, difficulty at the time in obtaining similar section rails from the rolling mills.
3. Unless the rails are carefully curved and skilfully twisted to the correct shape, increased rail and carriage wear follow, and may cause loose and leaky rivets in the spiral rail plates.

Piston Holders.

With piston holders a satisfactory and economic means has now been found of storing gas in quantities greater than has been dreamt of. Several huge-capacity holders are now on record abroad. A 20 million cu.ft. holder was erected in America in seven months. From the point of view of design, fabrication, and erection, there appears to be no reason why capacities of up to 35 million cu.ft. may not be erected in the future. Whether it is policy to develop such large capacities is very debatable.

Wet sealed holders of these dimensions in steel tanks would be practically impossible, owing to the excessive thickness of the side plating required. Concrete or brick tanks form an alternative, but the areas occupied, site conditions, time taken, and capital cost involved would no doubt rule these out of practical policy.

The absence of a water tank causes the total loads carried to be relatively small. They consist of:

1. The gross weight of the shell plating, column, roof, and piston when grounded.
2. The pressure on the foundations due to the overturning effect of the wind, *plus* an allowance for the weight of snow on the roof.

Where the site for any type of holder is good, there is not likely to be a wide difference in the capital cost of the foundations for a piston holder compared with that for the tank of a wet sealed holder, provided the latter requires only a simple reinforced concrete slab. Should the ground be bad, and large excavations or piling be necessary, the piston foundations will be the cheaper proposition.

In localities where the ground is likely to be affected by subsidence, piston holders are ideally suitable. The comparatively light weight of the structure and the fact that the loads are distributed over the stanchions, make it a reasonably simple matter to jack the structure into a safe position. In the Ruhr district of Germany, I understand this is common practice.

The holders being designed with balconies arranged at convenient levels in order to stiffen up the structure and to facilitate inspection, the whole of the external metal work can be conveniently examined and painted at any time; this also applies to the roof structure and the top side of the piston.

With the exception of the lowest 3 ft. of the shell plating, the whole of the inside can be inspected from the piston as it rises and falls. Preservation of the plating is effected by the use of the sealing tar in the M.A.N. and the lubricating grease in the Klönne. Inspection of the underside of the piston, the lowest 3 ft. of side plating, the bottom plating, and the piston joint, would necessitate throwing the holder out of commission.

A telescopic holder by virtue of its design may give rise to as many as five different pressures (depending on the number of lifts), at the inlet to the governors; the maximum pressure is often more than twice the minimum. At peak load times the minimum pressure thrown by a holder may be insufficient, with the result that boosting may be necessary and often emergency water gas plant put into operation in order to increase the stock for pressure requirements.

Boosting demands extra plant, attendance, and maintenance—all items of expenditure—so that if the use of existing plant, namely, the exhauster, can replace boosting, this will be the more economic method. This avoidance of separate boosting, provided the pressure required at the outlet of the exhauster is not too large, needs a holder giving fairly constant pressure. The piston holder almost fulfils this requirement.

Other advantages are that no deep wells are required for inlet and outlet pipes, and therefore there is less pumping, and there is no maintenance of lattice columns and bracing. On the other hand, the capital costs for smaller capacities. under 1¼ million cu.ft., are usually higher than for corresponding wet sealed holders, though this difference is not considered sufficient to outweigh the other advantages claimed. Mechanical means are needed to maintain a seal and the use of a sealing medium, which calls for special attention.

Welded Storage.

No Paper on gas storage would be complete without some reference to electric welding. In recent years rapid strides have been made in its development, and we are constantly hearing of the successful application of welding to structures which seemed destined for ever to be of riveted, bolted, or cast-iron construction; the gasholder is an example.

The Metropolitan Gas Company of Melbourne erected their first electrically welded gasholder in 1922—a three lift holder of 3 million cu.ft. capacity, the size of the lifts being 35 ft. deep by 197, 194, and 191 ft. diameter respectively; subsequently, by February, 1925, they constructed welded holders of 1 million and 3 million cu.ft. capacity with welded columns. In 1926 they created a record by completely dismantling a 3 million cu.ft. holder, and replacing it by a similar type welded holder, using the existing columns and

guides. The time taken to complete the work with a squad of men averaging 45 in number was six months.

These facts are very interesting and illustrate the amount of confidence which the Gas Company (who, incidentally, were responsible for the whole of the work, including research, testing, design, and erection) had in electric welding.

It would seem, therefore, that we in England have progressed very slowly in this direction! It may be a question of economics, or lack of confidence in welding generally. My personal view is that, broadly speaking, the riveted holder has served us very well, and in the absence of colossal advantages, such as reduced capital costs, there is little need to change. In addition, the development of steel structures has moved hand in hand with the development of riveted joints, and a wealth of information, text books, and data by authorities in all parts of the world are available.

Unfortunately, in regard to electric welding, there is nothing like the same authoritative information on the strength of welds in shear and tension, and particularly on the behaviour of welds under eccentric load conditions. Add to this the ever-raised question as to the personal reliability of the welder himself in maintaining a sound job, then it is not difficult to understand why we have not yet taken heartily to the welding of holders. Not long ago, the only information available came via the circulars issued by the electrode manufacturers.

I would like to suggest here that if an entirely welded holder does not seem acceptable, there are many parts and places on a riveted gasholder that would be improved if constructed by welding. For example, holder carriages are invariably bolted through the curb sheets or dip channels, and would be far better if mounted on baseplates welded to these places so that the bolts could be taken out and carriages removed and replaced if necessary. The bottom plating of any tank would be far better welded than riveted and would, in my opinion, leave less doubt as to leakage after the bottom has been lowered; inlet and outlet pipes if welded at site would lessen the dangers of leakage. At all places where it has been the custom to have bolts that are only removable when the holder is out of commission, and where a welded alternative can be arranged, this should, in my opinion, be done.

Ignoring capital costs, the following are some of the points which seem to favour the welded gasholder:

1. Welding is the only possible way of producing a homogeneous metal structure.
2. It abolishes leaking rivets or loose bolts, due to unsatisfactory workmanship or vibration.
3. The surface of the holder can be kept cleaner due to the absence of rivet heads picking up dirt. With oil filming, this will be more obvious.
4. The absence of rivets will reduce the quantity of paint required, and should expedite painting by presenting plain surfaces to the painter.
5. Inaccessible bolt heads in the gas space can be avoided.
6. The patching of plates is simplified.
7. During erection there is very little noise.
8. Removal of internal carriage difficulties in column holders, carriages being welded in. These will be far more rigid and the days of "fallen off" carriages will be removed.
9. The columns can be constructed so that the spaces between double members can be "closed" by runs of welded, thus reducing corrosion due to weather.
10. The worn rails on spiral holders can be repaired in position by welding.
11. A welded joint can be made equal to the strength of the plate as against 60% with single riveted joints.

Points which may not favour welded gasholders are as follows:

1. The doubt as to whether every welder can always produce a first-class weld. It is well known that climate, poor working conditions, small wages, and bad equipment often affect the worker; only the very best conditions will be conducive to good work.
2. Doubts as to the behaviour of welds under eccentric load conditions.
3. There is not sufficient proof that welding metal after years of service will not be affected by corrosion.
4. The dangers of pulling structural members into position by the use of wedges, and welding while under these abnormal conditions.
5. The necessity for special precautions to allow for contraction during welding, so that the sheeting may not have a buckled appearance.
6. Doubt as to the reliability of the design of vulnerable places such as curb stresses, &c.

Storage of gas under pressure in mild steel vessels may be described as the latest form of storage to be introduced into this country. This does not necessarily mean that low pressure storage is out of date, but the changing circumstances of distribution brought about by the gradual increase in areas of supply (not necessarily in the number of consumers), and the present tendency for larger undertakings and holding companies to take in smaller undertakings, close down their works, and operate under a form of grid by high pressure, necessitate consideration of this latest form of storage.

The fundamental difference between high and low pressure storage is that the first operates with a constant volume and varying pressure, while the latter operates with relatively constant pressure and varying volume. One of the most important advantages of high pressure storage is that it can be used to avoid the installation of larger mains, since by storing gas under pressure in outlying districts, the existing smaller mains can be operated at higher pressure. A holder can be situated at the works or out on the district, and may be arranged to supply gas at high or low pressure; automatic control for the filling and discharging of the holder is a quite simple and reliable engineering proposition.

Other claims for high pressure storage compared with low pressure are:

1. The space occupied is much smaller compared with an equivalent capacity wet sealed holder.
2. The foundations are simple, the weight to be carried by the earth being merely the weight of the vessel, *plus* a slight allowance for wind pressure.
3. The painting costs are much less since the surface area to be painted is much reduced, compared with wet sealed holders of equal capacity. In addition, there are no parts subject to alternate wetting and drying.
4. The vessel has no moving parts.
5. Their appearance is not likely to be objectionable in residential districts; being relatively small, they lend themselves to camouflage—*e.g.*, the planting of trees.
6. Maintenance costs in the form of inspection and painting are at the minimum.

The objection likely to be raised against this form of storage is the necessity for compressing plant, its cost and maintenance.

High pressure storage permits a holder to be built to meet current requirements. Additional holders can be added as and when the increased consumption requires additional storage, thus delaying high initial capital costs. Also, when the time arrives to add a further sphere, the circumstances may decide that a new site on the district would be more suitable.

Discussion.

The PRESIDENT (Mr. J. Richmond, of York) said the Author had referred to disasters occurring to certain piston type holders. He thought he was right in saying that no disaster had been found to be due to the failure of the holder itself, but rather to some outside circumstance. The question of disposal of gasholder water was certainly an important one owing to the difficulty in getting rid of this water without causing pollution trouble or nuisance. In some cases chlorination had been adopted with success. There was also the problem of rusting and consequent discoloration of the side sheeting. A rather useful factor in the piston type holder, particularly where space was limited, was its erection with bottom plate above ground so that the space below could be used for stores, garages, &c. With regard to pressure, the minimum pressure with the piston type was when it was full, thus there was always the advantage of "top pressure" when it was most needed—when stock was getting down. With this type of holder, station governors could be cut out if required, outlying district mains coupled direct to the holder, thus getting a relatively high pressure without the addition of a booster. In regard to the gum question, the President submitted that the piston type holder lent itself to the control of gum; painting was easier and less

costly than with the water sealed holder; there was less corrosion and less call for skilled men in dealing with the straight surface; and none of the difficulty of keeping the holder out of the water during painting operations. The sealing medium of the Klönne holder presented no difficulty and the degree of inspection required was not excessive. Mr. Richmond mentioned that they had a wrought iron holder at York which was more than 70 years old, whereas they had taken out a steel holder which was only 30 years of age.

Mr. HUBBARD, replying to the President's remarks, said he was not questioning Mr. Richmond's suggestion that disasters which had occurred to certain piston type holders were due to outside circumstances rather than the holder itself, though he recalled an account in the Technical Press during 1926 of an enquiry into the cause of a piston holder disaster. In that particular case it transpired that there had been considerable trouble with the piston tilting for some time prior to the disaster, and it was thought that the pitch of the guide rollers in a vertical direction had been made far too small. This particular holder, Mr. Hubbard believed, was the first of its type to be made. The present practice was to make the centres of these rollers between one-eighth and one-tenth of the diameter, to minimize all possibility of tilting. With regard to the painting of piston holders, he agreed that, assuming qualities of paint and workmanship were equal, painting costs would be cheaper than with column holders, although in the case of the spiral type he could hardly agree. In comparing painting costs for different types of holder one must look into that matter in detail and cautiously. He was interested in the long life of the wrought iron holder mentioned, as compared with a more recent steel one. Mr. Hubbard pointed out, however, that 30 years ago steel was only just getting into its stride and manufacturers had many difficulties to overcome. Present-day British steel was well known for its reliability and uniform composition.

Mr. A. W. FIELD raised a point as to whether Mr. Hubbard's reference in the Paper to the large amount of water employed for sealing in wet sealed holder tanks, and his suggestion for reducing it by annular construction, was not contradicted somewhat in the details of a tank for an 8 million holder shown in Sketch No. 1.

Mr. HUBBARD, in replying, stated that the annular form shown was merely offered as an economic alternative to a steel annular tank which would work with water in the annulus only, in which case the inner ring of plating would require to be heavily supported and braced to resist the collapsing pressure to which it would be subjected. In addition, the inner portion of the tank would require closing by means of a plate top similar to the holder crown, which would also be subjected to a collapsing pressure, namely, that due to the gas. Such a form, Mr. Hubbard stated, would increase the capital cost of a holder very considerably, and he thought his suggested one, as well as being cheaper, would reduce the amount of water to be emptied for inspection to a minimum, would facilitate inspection, and save considerable time.

Mr. T. G. LEWIS (Leeds) said the Author had made no mention of the question of ice formation in the lutes during the winter and evaporation of water in summer. There was also, of course, the question of the weight of a heavy accumulation of snow on the holders. To what extent was this likely to enter into the matter of the selection of the type of holder?

Mr. HUBBARD said that with telescopic holders, particularly of the column type, the dangers of titling and unsealing due to uneven snow loading had to be carefully considered. In spiral holders the danger was not so serious. As regards piston holders, particularly the tar seal type, extremes of cold might cause ice to form on the tar, but as these holders were working in Canada and America, where temperatures fell below zero, difficulties from ice formation in this country hardly seemed likely. The evaporation of water from the lutes of telescopic holders in summer was important and should not be forgotten when a holder was almost fully inflated and exposed to the sun for lengthy periods.

Mr. J. A. DERBYSHIRE (Shipley), referring to Mr. Hubbard's suggestion that paintwork appearance in spiral holders was substantially improved by the conveyance of water down the rails, agreed with that in general, but remarked that the dust was liable to get into the cups and involve some cleaning out. An interesting question also in regard to painting holders was whether the use of spray or brushwork was the more economical. Had Mr. Hubbard any experience of automatic lubrication? Mr. Derbyshire also asked whether Mr. Hubbard would care to state what he considered a good schedule of maintenance both for waterless and wet-sealed holders.

Mr. HUBBARD agreed with Mr. Derbyshire's observation as to dust in the cups. Much, of course, depended on the holder situation and surroundings. He was quite aware of automatic lubrication of holder carriages. At one time he was favourable to automatic types of lubrication generally, but recently had modified his opinion. He thought that the injection of a suitable grease into carriage bearings, either by means of a grease gun or lubricators of the Stauffer type, was to be preferred, as this brought places into regular supervision which normally would receive only spasmodic attention. He would refer Mr. Derbyshire to the Inspection Schedules for both types of holder as issued by The Institution of Gas Engineers. In Mr. Hubbard's opinion, spray painting would usually be cheaper than brush. On the question of maintenance and inspection, he thought the piston holder would be more expensive, owing to the fact that a piston holder lent itself to almost complete inspection at any time. If a wet-sealed holder could be inspected more thoroughly and as conveniently as a piston holder this, he was sure, would be done.

Mr. C. A. NEWHAM (Leeds), on the subject of welding in relation to gasholders, said he himself had been brought up in the "modern" school and had been familiar with the welded system all his career. At the same time, he was open-minded, and one sometimes came across some very remarkable conditions in welded work which tended to influence against welding gasholders. In regard to snow on the roof of a holder, Mr. Newham felt this most likely to be a source of trouble if associated with a gale than otherwise.

Mr. HUBBARD agreed with Mr. Newham's doubts about welding. There were comparatively little data on the subject of welding, particularly with reference to gasholders, and, of course, reliable data could only come from the hard school of practical experience. In considering welded design one must look upon it as a new technique, and be careful not to allow some of the old theories on metal design and riveted joints to run away with ideas on the newer method.

Mr. N. G. APPLEYARD (Leeds) said a point which had not been mentioned, but which the Gas Industry must nowadays consider quite seriously, was the question of safety against air raids as well as capital costs of holders. There was a potential danger in the future which must obviously be taken into consideration. Mr. Appleyard believed there was an element of doubt as to whether the waterless holder was as safe in this respect as the wet sealed holder.

Mr. HUBBARD said he was inclined to think the telescopic holder was likely to be safer than the piston type in that respect. The danger Mr. Appleyard presumably had in mind was that of gas in the trapped space above the piston. He thought this might be overcome by removing the roof covering and making some provision for dealing with rain water, or alternatively the provision of ample ventilation. He felt sure the piston type holder could be designed and arranged so that air raid difficulties were no worse than with wet sealed holders.

Mr. F. FIRTH (Leeds), in regard to troubles due to H_2S being generated in holders through bacteriological action in the tank water, said it would appear that the less water used the more unlikely would be H_2S trouble, and from this standpoint the waterless gasholder could claim a distinct advantage. Gumming troubles in some towns constituted a very serious problem, and the best safeguard against these was the condensation of moisture which took place in the holder during gas storage. The water fog provided a nucleus to which the particles of gum, also present in a state of fog, attached themselves and were removed from the gas with the condensed water. Where dehydration plants had been placed at the inlet of the holder, the practice was now to remove them to the outlet of holder if gum troubles were to be avoided. No advantage could be claimed by either the water sealed or waterless type on this question of gums, but the high pressure type of holder had its attractions, as storage, dehydration, and precipitation of gums were carried out in one vessel. With regard to appearance and safety the high pressure storage had much to commend it. Nobody could claim that a gasholder was a thing of beauty, and the less conspicuous it was the better. The danger zone of a waterless holder was the enclosed free space above the piston, and he thought perhaps the danger might be reduced by fitting a false piston about eighteen inches above the present piston in order to provide a buffer space in which gas leaks could collect, this buffer space to be ventilated to the atmosphere by telescopic shafts passing through the roof of the holder.

Mr. H. HODGSON (Leeds), referring to inspection and examination of holder plant as required under new legislation, asked whether Mr. Hubbard thought undertakings should be content with inspection by insurance companies' experts or train their own staff to these needs.

Mr. HUBBARD said his own opinion was that gas undertakings had sufficient practical and technical knowledge to do their own general examination and need not leave it to the insurance companies. That, of course, did not mean that they should not call in expert advice if thought desirable. An insurance company would no doubt refer such inspection to gas contracting experts. The undertakings could themselves do all that was necessary in getting into contact with contractors and thus maintain the goodwill already existing between the two sections of the Gas Industry.

Mr. R. N. WEBB (New Wortley Gas-Works, Leeds), said that Mr. Hubbard had commented on the possibility of working the waterless holder up to as high as 35 million cu.ft. capacity, a thing which was perhaps not possible in any water sealed holder. When one thought of the size of the largest water sealed holder known to-day it was easy to visualize what an immense structure would be required for that 35 million ideal and to have great doubts as to its practicability. He felt sure that the piston type holder could be made as safe as any other. As one who had been accustomed to the ordinary column holder, his own feeling was that to a large

extent, and especially in the matter of foundation, the piston type holder was the design of the future.

Mr. V. J. J. SIDDONS (Sheffield) proposed a vote of thanks to Mr. Hubbard, and Mr. DERBYSHIRE seconded. Mr. HUBBARD briefly responded.

On the motion of Mr. R. HOWARTH (Cleckheaton), seconded by Mr. ROCHFORD (Leeds), thanks were accorded Mr. C. S. SHAPLEY, Leeds Gas Engineer and General Manager, and the Leeds Corporation Property Committee for facilities granted the Association for the meeting at the Town Hall.

London and Southern Juniors

The Load Value of Appliances

We give below Mr. R. Tennyson-d'Eyncourt's reply to the discussion on his Paper before the London and Southern District Junior Gas Association on Jan. 18. The Paper and discussion were published in last week's "JOURNAL."

Mr. D'EYNCOURT, replying to the discussion, said he realized that some misunderstanding had arisen because the significance of certain statements was left to inference. For instance, the title should perhaps have been suffixed with a question mark in preparation for the actual conclusion; more emphasis should have been laid on the great difficulty in obtaining logical load values, as well as on the obvious importance of considering any one appliance in relation to others installed on the same premises, and to the means of the respective consumers; profit referred to originally in the most general way would better have been cloaked under the evasive term "economics," a term ultimately applying equally to business or public service.

In particular, he notices that "no mention appeared of the load value of appliances as it affected mains or services, or, to go one step further, the works"; but he inferred that on occasions too much consideration was given to such factors at the expense of satisfaction to the consumer, whose requirements, within reason, should always be met.

With regard to lighting installations, it was unfortunate that certain difficulties in establishing the loss of consumption, where consumers had gone over to electric light, deterred him from offering any indication of its probable load value, a value which everyone recognized as of considerable importance, but which must remain a problematical guide to sales policy.

The suggestion, made later, that the subtraction method could be applied to the figures given for some 400 houses on new estates, and thus obtain a value for lighting of only 1,300 cu.ft. per annum, simply could not be considered since the number and circumstances of the installations did not entitle one to do so. In fact, the figures were shown merely to illustrate the small variation in annual consumptions in spite of a wide variation in the numbers of appliances installed.

That actual average annual consumptions for slot consumers did appear greater in certain cases than for ordinaries should not provide a cause for suspicion since many slot consumers were relatively better off than ordinary consumers, having only the same number of appliances installed. Annual consumptions for differing types of water heaters must likewise vary with the class of property in which they were installed, the class of property itself being an index to the consumers' means, while the number of times per week people should have a bath bore no relation to the number of times they did. It was obvious that gas fires fitted in certain rooms would provide a better load than in others; but from the point of view of sales policy, the present objective was to sell gas fires in general and for an unknown location, and in consequence only an average consumption could be assumed, or considered.

While admitting that the Industry and others gave good service for the money expended, Mr. d'Eyncourt still contended that the British public for the most part grudged all expenditure on these services, but were prepared to pay for the purchase of appliances, which represented not only a part of home equipment, but ultimately a real asset. For this reason alone it was better to sell appliances which might not at once be made full use of, rather than to allow business competitors to step in and remove their chances of obtaining even a partial load. The possibility of obtaining only a low load must at all times, however, be recognized.

The suggestion that the pilot flame of a multi-point burned continuously would consume more than the apparent annual load value of the appliance was obviously correct, but known facts showed that full advantage was at present seldom taken of the service available, and that considerable and continued efforts were necessary to educate the public to a fuller use of hot water, which it must be remembered had run from taps only for the minority in the past.

Storage water heaters had undoubtedly provided a far better load value to undertakings than other forms of heaters, but the fact must not be overlooked that these had been installed up to the present only in the houses of people prepared to pay for the full and carefree service obtainable. Installed in the homes of most consumers at present using single-point heaters they might never even be lighted, or at the most only once a week. Too much emphasis could not be laid on the fallacy of considering only potential load values without regard to the circumstances in which it was proposed to install the appliances, though it must be admitted that more attention should be concentrated on promoting the use of storage water heaters among certain classes of consumers, and to this end limited subsidization of the installation by means of an "appliance tariff" appeared justifiable. This was, in fact, done in the case of the 6d.-a-day all-in charge scheme offered by Mr. d'Eyncourt's Company. He suggested that the higher value obtained on an L.1 refrigerator might be due to the fact that it was not thermostatically controlled.

A full and proper analysis of load values would, in Mr. d'Eyncourt's opinion provide a full time job for a knowledgeable man for at least a year, while it was conceivable that the whole area would have to be re-surveyyed to obtain sufficient details. The actual average load values of all appliances should be shown for all combinations of installations, and each should be subdivided into four categories, two for ordinary consumers, and two for slot according to locality.

Western Junior Gas Association

Meeting at Weston

A meeting of the Western Junior Gas Association was held at Weston-super-Mare on Jan. 22. There was an exceptionally large attendance at the meeting, and those who attended with the special object of seeing the new carbonizing plant, which was described fully in the "JOURNAL" for Dec. 1, 1937, were amply repaid for their effort. A Paper was read after the visit by Mr. A. G. Holtam, Distribution Engineer of the Cheltenham and District Gas Company.

The members were welcomed by Capt. H. G. Picton Davies, Deputy Chairman of the Company. He apologized for the unavoidable absence of the Chairman, Alderman Henry Butt, J.P. Mr. James Taylor, Engineer and General Manager, explained the details of the programme.

Immediately after the visit, tea was served by invitation of Chairman and Directors in the Company's Sports Club Room. The thanks of the Association were expressed by the President, Mr. J. E. Akroyd (Swindon, G.W.R.), who referred to the excellence of the works and the generous way the Directors of the Weston Company and their Engineer, Mr. Taylor, assisted the work of the Association.

Captain Davies and Mr. Taylor both replied to the vote of thanks.

Honorary Members' Prizes

The Honorary Members' Prizes for the session 1936-37 have been awarded to the following members of the Western Junior Gas Association:

First Prize.—Mr. A. Facer, formerly with the Bristol Gas Company and now with West's Gas Improvement Company, for his Paper, "Some Aspects of Unaccounted-for Gas."

Second Prize.—Mr. K. G. Bodiley, Weston-super-Mare and District Gas Company, for his Paper, "Some Modern Methods of Street Lighting."

[Mr. Facer's Paper was dealt with in the "JOURNAL" for Nov. 4, 1936, and Mr. Bodiley's in our issue of March 21, 1937.]

A Portable Gas Furnace

The December issue of the *National Gas Bulletin* of Australia makes interesting reference to a portable gas furnace which has been installed at the works of the Australian Drop Forging Company, Ltd., of Sydney. This furnace, it is stated, can do the work of several stationary furnaces, which it may displace by virtue of its mobility.

The whole apparatus is mounted on castor swivel wheels and carries its own direct-coupled electrically-driven motor, air blower, and burner equipment arranged in a way which calls for only two connections. The purpose of the furnace is to heat brass blanks as a preliminary to drop forging. The blanks are charged into a hopper at the rear of the furnace and are admitted one by one into the furnace through a door opening, which is covered with a foot treadle operated slide. The charge passes to the front of the furnace, where the operator places every individual disc under the drop forging hammer, which, with one or sometimes two blows, forges the required article. The advantage of gas for this class of industrial work is its great flexibility.

The furnace, which was installed by the Australian Gas Light Company, is of the semi-muffle inclined hearth type and is thermostatically controlled, with the result that the operator always works with the precise temperature needed.

Specifications for Tar Carpets - - -

From a Paper by W. E. Cone, Technical Adviser to the British Road Tar Association, at a meeting of the West of England Branch of the Institute of Quarrying at Bristol on Jan. 27.

The study of the problems of design of tar carpets has aimed at the characterization of those properties of the materials which may contribute to the success or failure of the carpet, and the influence of the manufacturing and constructional methods on the results to be obtained by their use. Consideration can now be given to specifications which embody materials whose constituent properties, both singly and in combination, are satisfactory for the purpose in view. The British Road Tar Association has devoted a considerable amount of time to the preparation of suitable specifications for thin tar carpets, and their task has been greatly facilitated by the development work and practical results obtained over the last few years by a number of its members. The following recommendations are based on the collective experience of successful carpeting work, and it is hoped that they will serve as a guide to all those interested in this new development of tar surfacing.

Description.

The specification is to be used for what may be termed "coarse" carpets containing a maximum size of aggregate of ¾ in. gauge; "medium" carpets containing a maximum size of aggregate of ½ in. gauge; and "fine" carpets containing a maximum size of aggregate of ¼ in. gauge. Carpets of these three types have proved satisfactory in practice in providing non-skid sound wearing surfaces.

Aggregate.

The aggregate for "coarse" and "medium" carpets shall consist of granite (including other igneous rocks), limestone, slag or gravel of approved quality, or mixtures thereof. The material below ⅛ in. may consist of any of these aggregates or sand of approved quality.

The aggregate for "fine" carpets shall be similar to that for "coarse" and "medium" carpets, but gravel and sand shall be excluded.

Filler.

The filler shall consist of cement, limestone, or other approved material, of which not more than 20% shall be retained on a 200 mesh sieve.

Binder.

For "coarse" and "medium" carpets the binder shall consist of a manufactured coal tar.

The recommended viscosities for the binder when the material is laid on the day of manufacture shall be as follows:

100–140 seconds at 30° C. (B.R.T.A. viscometer) during the winter months
70–100 ,, ,, 35° C. (,, ,,) during the summer months

The recommended viscosities when the material is laid twenty-four hours or more after manufacture shall be as follows:

40–50 seconds at 30° C. (B.R.T.A. viscometer) during the winter months
100–140 ,, ,, ,, (,, ,,) during the summer months

For "fine" carpets the binder shall consist of a manufactured coal tar of a viscosity of 35-45 seconds at 30° C. (B.R.T.A. viscometer).

Quantity of Binder.

The quantity of binder per ton of stone used in the mixture shall comply with the figures set out in the following table (a working tolerance of ±5% of the quantity specified will be allowed).

Grading.

The gradings for use with the above-mentioned types of carpet and aggregates shall conform as closely as possible with the following table (a working tolerance of ±20% of the percentage specified will be allowed). The relative proportions of coarse aggregate (above ⅛ in.) to fine aggregate (below ⅛ in.) for the "coarse" and "medium" carpets shall be reasonably accurate.

	Coarse Carpets.	Medium Carpets.	Fine Carpets.
Gradings shall be in accordance with sieves to B.S.S. No. 410.	%	%	
Passing ¾ in. retained ½ in. . .	25	—	
,, ½ ,, ,, ⅜ ,, . .	20	25	
,, ⅜ ,, ,, ¼ ,, . .	20	25	
,, ¼ ,, ,, ⅛ ,, . .	10	25	
,, ⅛ ,, ,, 18 mesh	5	5	
,, 18 mesh ,, 52 ,,	10	10	
,, 52 ,, ,, 200 ,,	5	5	
,, 200 ,, (including filler) . .	5	5	
	100%	100%	
Passing ¾ in. retained ⅛ in. . .			% 5
,, ⅛ ,, ,, 18 mesh			45
,, 18 mesh ,, 25 ,,			15
,, 25 ,, ,, 52 ,,			15
,, 52 ,, ,, 85 ,,			10
,, 85 ,, ,, 200 ,,			10
			100%
Binder—Galls. per ton of aggregate at working temperature (140° F.–200° F.)	10·5	11·5	15

Manufacture.

The normal bin sizes of aggregate shall be sifted on B.S. screens for grading analyses to determine the gaugings and proportions necessary to give suitable mixtures for the "coarse," "medium," and "fine" carpets. In practice it will be found that the requirements can be met from combinations of two or more bin sizes of aggregate, and when the proportions of the different gaugings of aggregate for each mixture have been determined every precaution shall be taken to ensure their delivery simultaneously into the mixer in correct quantities.

The temperature of the dried aggregate shall be between 120° F. and 160° F. when treated with the binder. The temperature of the binder shall be between 140° F. and 200° F. The filler shall be added to the mixture after the aggregate has been coated with the binder and mixing continued until the filler is incorporated.

The aggregate, filler, and binder shall be accurately weighed or measured by suitable devices.

Preparation of Road Surface.

The road surface shall be swept clean and prepared as regards approximate levels by the filling in of deep depressions by means of the carpet material or tarmacadam, so that a uniform carpet may be laid to the consolidated thickness specified. The road surface shall receive no pre-treatment if it has a bituminous surface which is in good condition and is slightly rough. If the surface is rich in binder it shall be removed by burning off with a road heating machine. If the bituminous surface is very smooth and hard, it shall be scored with picks to provide a key for the carpet. A new waterbound surface requires pre-treatment with a tack coat of tar emulsion and to prevent dry dust from penetrating into the carpet. If a "fine" carpet is to be laid a sprinkling of the actual carpeting material shall be applied while the emulsion constituting the tack coat is breaking.

A concrete surface which is reasonably rough needs no pre-treatment, but if it is smooth it shall be given a very light application or tack coat of tar emulsion, with a rate of spread of not less than 12-14 sq.yd. per gallon. With a stone setts road, any setts that project much above the others shall be taken out and lowered.

Thickness.

The minimum thickness of the carpet, after consolidation by the roller, shall be 1 in. for the "coarse" mixture containing ¾ in. maximum aggregate; ½ in. for the "medium"

mixture containing ½ in. maximum aggregate; and ¼ in. for the "fine" mixture containing ¼ in. maximum aggregate.

Transportation and Laying.

The mixture shall be delivered from the plant to the site of the work in vehicles previously cleaned of all foreign materials and protected by tarpaulins against all weather conditions. Each load shall be discharged on the clean surface of the road well clear of the area to be covered by that load. It shall then be immediately distributed into place by means of shovels or forks and spread by means of heated forks or rakes, and every precaution shall be taken to keep the material free from dirt or foreign matter before and after spreading. The carpet shall be rolled to a true surface commencing at the channel and working by half-wheel widths to the centre of the road, consolidation being effected by a roller weighing not less than 6 tons or more than 10 tons, until no impression is made thereby on the newly laid surface.

It is suggested that for the "coarse" and "medium" carpets suitable temperatures for rolling the mixtures are about 25-30° C. (77-86° F.) in the winter, and about 30-35° C. (86-95° F.) in the summer. In the case of the "fine" carpet it can be rolled cold.

The length of time between the spreading and the commencement of rolling must depend upon the weather.

Tottenham and District Gas Company's Special Order

(*Continued from p.* 260.)

When the Enquiry was resumed at the Board of Trade Offices on Tuesday, Jan. 25, it was announced that the Enfield Urban District Council no longer appeared in opposition to the proposed Order.

Mr. JACQUES ABADY (for the Tottenham Gas Company) said it was obvious that there was a difference of cost of supply in the Southgate and Tottenham areas of rather more than 1d. per therm. It had been said in evidence that that was due to the cost of the service of capital. That had been challenged by Mr. Bidder, and an analysis had since been made of the capital and revenue accounts of the Southgate and Tottenham Companies for the year 1936 (the latest that were available). That analysis did not show that the difference of cost of supply in the two areas was due mainly to the difference in capital charges, but it did show that part of the difference was due to differences in capital charges and part was due to a difference in revenue expenditure. He proposed that Mr. Evetts should put the figures forward.

Mr. H. F. BIDDER (for the Finchley Borough Council) said that the Company had assumed the burden of proving that the differential of 1d. per therm as between the two areas was justified, and it had been said in evidence that the capital charges in the case of the Southgate Company were in the neighbourhood of 1d. per therm more than in the case of the Tottenham Company. Investigation had shown that this was not so. The basis on which it was put forward was unsound. He asked whether, inasmuch as one principle had been found to be fallacious, the promoters of the Order were to be allowed to hunt around for another principle with which to justify their contention. He objected to replacing previous evidence by different evidence.

Mr. ABADY pointed out that the basis of the demand for the differential charge was that there was in fact a difference of at least 1d. per therm as between the costs of supplying Southgate and Tottenham.

Mr. RONCA (Director of Gas Administration) said he did not think he could avoid hearing a second witness if put forward by the applicants.

Pence per Therm Sold.

Mr. *Evetts* put forward his analysis of the revenue and capital accounts of the two Companies, expressing the results in terms of pence per therm sold. He gave details of the costs incurred by each Company in respect of gas manufacture and distribution; collection, printing, and national insurance; and rates, and showed that in respect of all those items together the Tottenham Company's costs were 0·65d. per therm less than the Southgate Company's costs. Capital costs were less in the Tottenham Company than in the Southgate Company by 0·35d. per therm; and miscellaneous expenses were less by 0·25d. per therm. Thus, in total the costs of supply in Tottenham were 1·25d. per therm less than in Southgate. The difference of 0·25d. per therm in respect of miscellaneous charges might be expected to diminish as the result of the amalgamation; but for that fact, there would be justification for a differential charge of more than 1d. per therm. The differences in the other costs would not be altered immediately as the result of amalgamation.

Mr. BIDDER suggested that fundamentally a differential charge should be based not on accidental differences in receipts from residuals and rentals, but on differences in capital charges. The residuals arising from the manufacture of gas must be the same in quality in the two Companies, and any difference in the receipts from residuals must be due to differences in commercial applications. But on amalgamation the Tottenham Company would do the same with the Southgate residuals as with the Tottenham residuals.

Mr. *Evetts* replied that there were three things affecting the income derived from residuals. In the first place, better technical skill might produce more tar, coke, and benzole in one gas-works than in another. Secondly, the market at Tottenham might be better than that at Southgate; and thirdly, the selling methods at Tottenham might be better or worse than at Southgate. With regard to receipts from rentals, much depended upon policy. Without referring specifically to the Tottenham or Southgate Company, he said it might be the policy of one gas company to charge a very high stove and meter rental and a very high surcharge on prepayment meters, and in turn might provide a very much better service than another company for that money, so that there would be a higher expense on one side and a higher return on the other. On the other hand, a Company might make a very high charge and give a very bad service. Those matters affected the price of gas fundamentally and one could not rule out receipts from rentals and residuals when considering the cost of supply.

(That concluded the evidence.)

Mr. BIDDER, addressing the Director, urged that the real justification for a differential charge in a particular area must be that the cost of supply there was greater than the corresponding cost in another area. Comparisons of the figures for the two undertakings showed that the capital and working costs, apart from receipts from rentals and residuals, were very much the same, so that the Tottenham Company did not start as administrators of the Southgate area with any appreciable difference of the cost of supply as between the Tottenham and Southgate Companies. But it did start with the advantage of the combination of the two undertakings, and unless the Tottenham Company saw that some advantage was likely to accrue, presumably it would not ask to take over the Southgate undertaking. The difference in the conditions consisted entirely of the difference in receipts from residuals and rentals, which was something approaching 1d. per therm. But how could that be a reason for differentiating the charges for gas as between the two areas? It had been suggested that greater income might be derived from residuals by one Company than by another by reason of better technical results being achieved in one case. But after the amalgamation the technical skill would be applied by the Tottenham Company, so that the technical results for the combined undertakings should be the same. Again, presumably all the residuals would be marketed by the Tottenham Company, and the selling methods applied would be those of the Tottenham Company. It had been said also that receipts from rentals were dependent upon policy. But again the policy for the whole area would be that of the Tottenham Company, and the classes of gas appliances offered would be the class that the Tottenham Company had available. A differential should not be allowed merely because some of the avenues of receipts at the moment yielded less in the Southgate area than in the Tottenham area.

Therefore, he asked that a differential should not be allowed in any part of the present Southgate Company's area. But if a differential charge were allowed at all, he asked that it should not be applied to the Finchley part of the Southgate Company's area, which was already closely built up, so that there was no question of fresh mains being necessary there.

A Three-Year Limit.

Further, he asked that if any differential at all should be imposed its application should be limited to three years, instead of being allowed for an indefinite time, with power of revision. He also asked that there should be no power to the Company to apply for an increase of the differential at any future time. The power that the Company, as well as local authorities, could apply for revision was given where differential charges were made com-

pulsory, and where it would be necessary for the Company to apply to the Board of Trade even to lower the differential. But in this case the proposed differential was to be discretionary, and the Finchley Borough Council objected to the Company having power to apply for an increase of the differential.

Power to Seek Revision.

Mr. ABADY emphasized that the power to charge the differential was permissive and there was a general power to ask for revision. He would have thought it inappropriate and unjust that the power should be limited in any general case. But the history of the Tottenham Company showed that its policy was to fit differential charges to the needs of each case, and to reduce them gradually from time to time. The Clause relating to the differential had been accepted by the Borough of Southgate and the Middlesex County Council.

As to the suggestion that if any differential were allowed at all, it should not apply within the borough of Finchley, he urged that it was quite a wrong principle to carve up an existing supply district in which there was already a uniform charge and to say that one small part of it was more densely populated than another and, therefore, should be exempt from the differential. It was against any principle which had ever been followed by the Board of Trade. The figures put forward by Mr. Evetts, and which had not been contradicted, showed that the sales per consumer over the whole of the Southgate Company's area averaged 128 therms per annum; and calculation showed that the sales per consumer in the part of Finchley which was supplied by the Southgate Company averaged 125 therms per annum. So that the consumption figures did not justify the suggestion that there should be a lower charge in Finchley than in the remainder of the Southgate Company's area. Neither did the map show that one part of the Southgate Company's area was more built up than another.

With regard to the point that there should be no differential charge to the Southgate Company's consumers unless there was a definite element of difference of cost in the strict sense, he said Mr. Bidder's idea of the strict sense was to take an entirely novel view of the cost of supplying gas, by omitting to deduct from the expenditure side of the revenue account the two main items of receipts from rentals and residuals. That was a novelty which would not appeal to the Board of Trade. It had been shown that the difference in cost as between the Southgate and Tottenham areas was actually 1·25d., but the Company asked for a differential of only 1d. It was reasonable to expect to save the 0·25d. per therm almost immediately as the result of the amalgamation. It was possible also that by good management some further reduction of the difference could be effected, and the Tottenham Company's record showed that differentials were reduced where reductions were justified.

Therefore, he urged that the proposed basic price and differential charge had been justified and that the Order should proceed without amendment.

Campsie Gas Extension

Board of Trade Enquiry at Kirkintilloch

An Enquiry was held by Mr. J. F. Ronca, Gas Administrator at the Board of Trade, in the Court Room at Kirkintilloch on Jan. 27, in connexion with an application by the Kirkintilloch Town Council for a Special Order under the Gas Undertakings Act to enable them to extend the existing limits of gas supply and to authorize them to supply gas in that part of the parish of Campsie which the Town Council are not at present supplying gas; to transfer to and vest in the Town Council the undertaking of the Lennoxtown Gas Light Company in terms of the agreement entered into with the Gas Light Company.

Mr. MONTGOMERY, Advocate, who appeared for the promoters, along with Mr. Alexander Thorburn, explained that objection had been lodged by the Dumbarton County Council, the County Council of Stirling, and the Corporation of Glasgow. The matters which remained in controversy fell within very narrow limits. They had been successful in arriving at agreement with the County Council of Dumbarton. They had also settled with L.M.S. Railway Company. There was still one small objection by the Glasgow Corporation which was really a question of law. The sole outstanding objection was by the County Council of Stirling in respect of certain clauses which they wished to have inserted. The promoters had reached settlement with the Dumbarton County Council with regard to the powers to charge a maximum excess of 7·33d. per therm within the limits of supply above the charge in Kirkintilloch. They had agreed with the Dumbarton County Council to limit that clause authorizing the excess price to the Parish of Campsie. As a result, Dumbartonshire opposition dropped out. The only party affected would be the County Council of Stirling, and they did not object to that. The promoters had met Dumbarton's objections regarding breaking up streets, &c., by extending the period from three to fourteen days. Stirling County were offered a similar clause, but refused it, and proposed something very drastic which seemed to place upon the promoters a very onerous condition indeed, to cut off the supply and take up pipes, &c., at their own cost. There was no precedent in any Gas Acts for the insertion of such a clause. The objection of Glasgow Corporation was that they had at present power to supply gas within a part of the parish of Campsie and they objected to the promoters being given power to supply gas within their area. His answer was that Glasgow Corporation had no power to supply within the Parish of Campsie at all. There was no specific mention of the Parish of Campsie, and therefore the objection fell to be disregarded. They would require to say Campsie was part of the suburbs of Glasgow.

Mr. TEMPLETON said he had instructions to accept what had been referred to, and he asked permission to withdraw.

Mr. GORDON argued that part of Campsie Parish was included in the Glasgow area according to the plan which he produced, and the Corporation objected on principle to another authority coming within their area of supply. When they discovered this was in their area, they approached the promoters to amend their Order, but the Kirkintilloch Council paid no attention. Glasgow had no desire to supply gas in this area; but they objected to intervention within their limits of supply.

Mr. RONCA did not think it was for him to give an interpretation of the boundaries of Glasgow.

Mr. Montgomery said that while the map showed a portion of Campsie within the limits of Glasgow supply area, it was irrelevant, since Campsie was not within the city and was not specifically mentioned. Even if it was the case that Glasgow Corporation were authorized to supply gas within the disputed area, the Board of Trade could still authorize the promoters to supply gas in competition with them, as Glasgow Corporation had not supplied gas there.

Mr. Morrison, who appeared for Stirling County Council, stated that the fact that the Town Council under the 1847 Act had power to lay pipes in the roads and bridges might interfere with the exercise of the County Council's powers. As highway authorities, the County Council were perfectly entitled to ask for this clause for their protection. It was not only a question of local interest but general interest.

The only witness called was Mr. *James Dickson,* Engineer and Manager, who gave statistics regarding Kirkintilloch Gas-Works. The price of gas for the last eight years had been 2s. 1d. per 1,000 cu.ft. and was now 2s. 3d. and 2s. 4d., compared with 4s. 9½d. and 5s. in Lennoxtown. He mentioned coke ovens at Auchtengeich belonging to Messrs. James Nimmo & Co. and also Messrs. Wm. Baird & Co., Ltd., Twechar, as sources for supply of gas in emergency. The intention was to close down Lennoxtown. They hoped to supply gas cheaper to Lennoxtown than they had now.

Mr. RONCA asked that calculations be submitted showing the reason for the differential rate in Campsie, and Mr. Dickson agreed to prepare these.

The decision of the Board will be issued later.

Combined Gas and Solid Fuel Fire

A Radiation Patent

The subject, a recent patent (B.P. No. 476,825) taken out by Radiation Limited, H. J. Yates, and V. H. Mulroy, is a combined gas and solid fuel fire. The invention comprises the combination with the front of a solid fuel grate of a pivotally mounted gas fire which can be moved into a position in front of and above the grate when required to be brought into use. When a solid fire is required, then the gas fire is moved into a position in front of the ash space below the grate. The gas burner of the fire is stationary, and a pivoted frame carries the radiants. A friction-checking device is employed to retard the free movement of the fire when swung from the upper to the lower position, thus minimizing risk of injury to the radiants. For removal of ashes when a solid fuel fire is in use, the gas fire is moved temporarily to its operative position.

Gas Undertakings' Results

Nelson.

Mr. G. R. Macfarlane, Engineer and General Manager of the Nelson Corporation Gas Department, in his annual report, states there has been an income of £109,138 and net profit of £4,569 for the past year. Coal gas made was 504,801,000 cu.ft., and carburetted water-gas 5,981,000 cu.ft., making a total of 510,692,000 cu.ft. The coke market was good throughout the year, and the local demand almost exceeded the supply. The gross income from residuals and by-products was £17,102. The sale of appliances through the showroom showed a remarkable upward leap in comparison with the preceding twelve months, reaching £9,473. This shows an increase of 120% over the year 1932-33.

Weymouth.

The report of the Directors of the Weymouth Consumers' Gas Company for the year ended Dec. 31, 1937, states the sales of gas again show an increase, the amount sold for the year being 1,409,532 therms. This, compared with the previous year, shows an increase of 34,530 therms, which is equivalent to 2·5%. During the past year there has been a considerable increase in the prices of all materials used in manufacture and distribution. Coal has been increased over 20%. The Directors, having given the matter careful consideration, do not propose making any alteration, at present, in the price charged for gas. The sales of fittings, both by cash and hire-purchase, are again very satisfactory. Receipts for residuals show a very substantial increase on the previous year. After providing for the interest on the debenture stocks, the balance at the credit of the net revenue account is £6,085, out of which the Directors recommend the payment of the following dividends: On the ordinary stock at the rate of 6% per annum, less income-tax, less the interim dividend already paid to June 30, 1937. On the 5½% redeemable preference stock at the rate of 5½% per annum, less income-tax, less the interim dividend already paid to June 30, 1937.

Trade Notes

Cochran & Co. [Annan], Ltd.: Telephone Number.

The telephone number of Messrs. Cochran & Co. (Annan), Ltd., 32, Victoria Street, S.W. 1, has been changed to Abbey 4441.

R. & J. Dempster, Ltd.: Telephone Number.

The telephone number of the London office of Messrs. R. & J. Dempster, Ltd., at 34, Victoria Street, S.W. 1, is now Abbey 4426.

Rateau Turbo Exhausters, Boosters, and Blowers.

The Bryan Donkin Company, Ltd., Chesterfield, have supplied to date 418 Rateau turbo exhausters, boosters, and blowers in such situations as gas-works, coke ovens, and industrial plants, the total capacity of the machines being 249,737,632 cu.ft. per hour.

This centrifugal machine is described in a handsome booklet recently published by the firm. The booklet gives photographs of a number of characteristic installations in a wide variety of situations. In the course of this description, it is stated that where the volume of gas to be dealt with is considerable, the use of a positive type of machine becomes inadvisable owing to the large size of machine involved. In addition, where large volumes are involved, the pressure increase required is generally moderate, and the Rateau turbo machine is very suitable for such conditions. Among the special features of these fans are high efficiency, 70% being guaranteed in actual working; absence of noise and vibration; and complete absence of pressure pulsation.

Herbert Morris, Ltd.: Factories Act, 1937.

As is well known, the Factories Act, 1937, comes into force on July 1. It will then be a legal obligation to have all cranes, hoists, and lifting tackle (1) thoroughly examined by a "competent person" and (2) properly maintained.

Some forty years ago Messrs. Herbert Morris, Ltd., Loughborough, started an inspection and maintenance service for their customers, and this proved so popular that it grew steadily year by year. They have now experienced crane engineers throughout the country, and these are backed up by a reconditioning workshop at Loughborough, equipped with special plant and manned by expert mechanics.

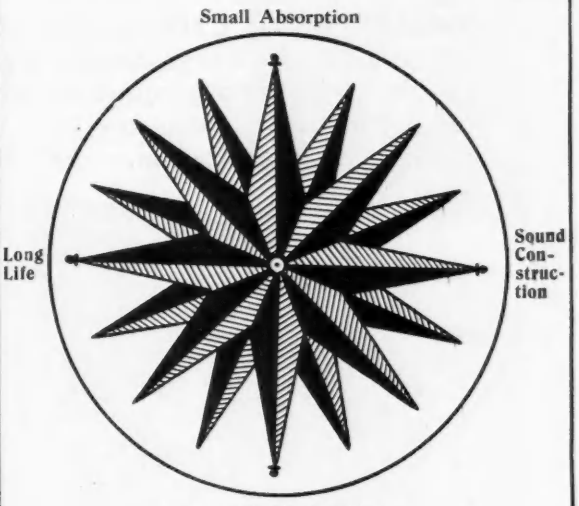
The firm offers:

(*a*) Their inspectors for the "thorough examination" of cranes and lifts specified by the Act, at the time stipulated.

(*b*) Maintenance men to keep lifting machinery in good working order by means of regular visits.

(*c*) Repair men to recondition portable tackle and make it fit to pass the inspector.

All the Cardinal Points



ARE CAREFULLY WATCHED IN THE CONSTRUCTION OF OUR METERS

OUR HIGH CAPACITY

METERS

are specially designed for their work and register accurately, with a minimum of pressure loss under

The most severe tests

MANY SPECIAL AND DISTINCTIVE FEATURES ARE INCORPORATED AND ARE WELL WORTH YOUR EXAMINATION.

SAWER & PURVES

(BRANCH OF METERS LTD.)

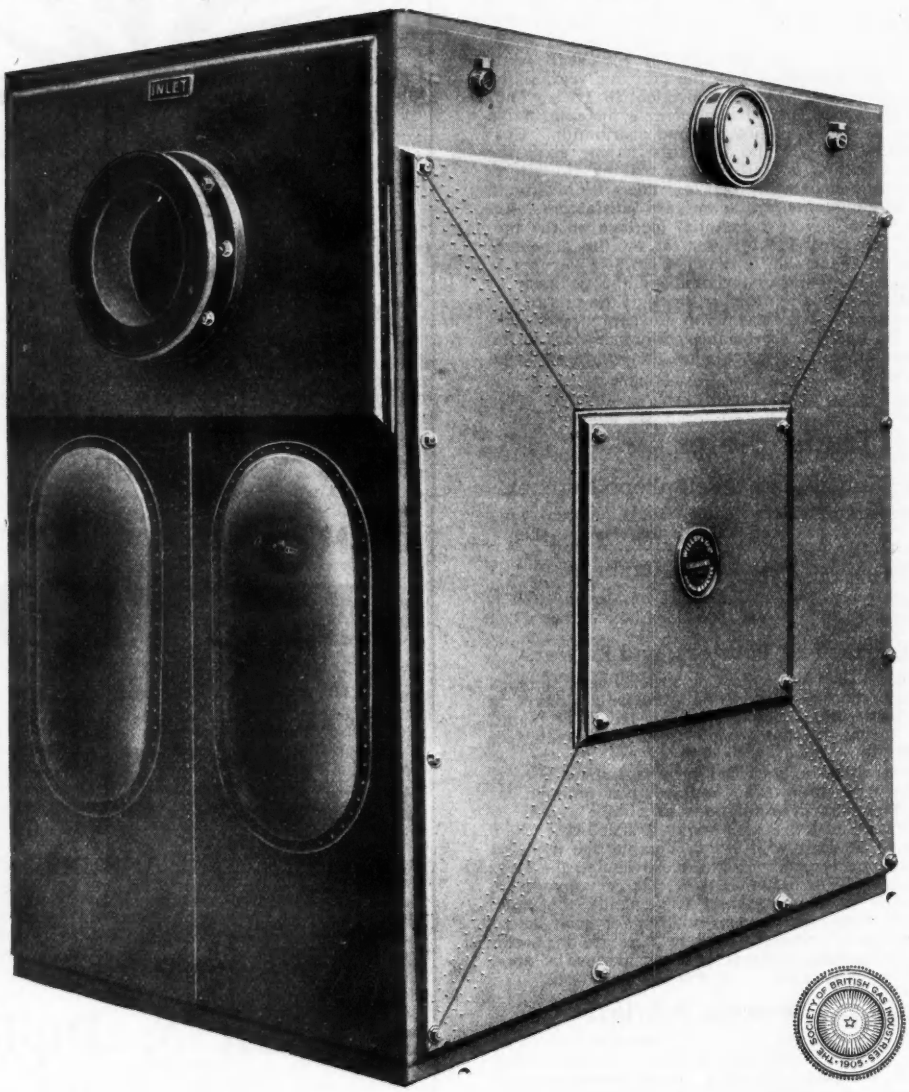
DERBY ROAD, WATFORD.
Phone: 2645.

Radford Meter Works, Radford Road, NOTTINGHAM.
Phone: 75202.

Nelson Meter Works, Miles Platting, MANCHESTER.
Phone: 2289 Collyhurst.

METERS for LARGE CONSUMERS

WILLEY & CO., LTD., are one of the best known makers of Meters for all capacities. Large Stocks always available, 50 cu. ft. up to 50,000 cu. ft. Installations complete with valves and connections quoted for on application. Also any Gas Works Plant, from Retort to Burner, supplied to specification. Extensive plant and resources.



WILLEY & CO. LTD.

Makers of everything for Gas

Phone : EXETER 4064 Telegrams : WILLEY, EXETER.

LONDON - MANCHESTER - LEICESTER - DARLINGTON

Telephones : London : Clissold 6166. Manchester : Ardwick 3909. Leicester : 24177. Darlington : 2586

Markets and Manufactures

Current Sales of Gas Products

The London Market

Jan. 31.

A few changes are to be noted in the prices of Tar Products, to-day's values being as under:

Pitch, 38s. per ton f.o.b.

Creosote, 5⅞d. to 6d.

Refined tar, 3¾d.

Pure toluole, 2s. 2d. to 2s. 3d.

Pure benzole, 1s. 8d.

95/160 solvent naphtha, 1s. 7d.

90/160 pyridine, 10s. to 11s.

Prices are per gallon naked at makers' works.

The Provinces

Jan. 31.

The average prices of gas-works products during the week were: Gas-works tar, 24s. to 29s. Pitch—East Coast, 38s. to 39s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 38s. to 39s.* Toluole, naked, North, 1s. 8d. to 1s. 9d. Coal tar, crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 5½d. to 1s. 6d. Heavy naphtha, North, 1s. 3d. to 1s. 3½d. Creosote, *ex* works, in bulk, North, liquid and salty, 5d. to 5½d.; low gravity, 4¾d. to 4½d. Heavy oils, in bulk, North, 5d. to 5¼d. Carbolic acid 60's, 3s. 3d. to 3s. 6d. Naphthalene, £13 10s. to £16. Salts, 80s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal; "B" quality unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Scotland

GLASGOW, *Jan.* 29.

There is still very little new business being arranged and prices are, therefore, rather unstable. If anything, however, enquiries for prompt and early delivery are more plentiful.

Crude gas-works tar.—Actual value is 37s. to 38s. per ton *ex* works in bulk.

Pitch remains weak at 28s. to 30s. per ton f.o.b. for export and round 28s. per ton *ex* works in bulk for home trade.

Refined tar.—Price for home consumption is fixed at 3¾d. to 4d. per gallon, and for export value remains unchanged at about 3d. to 3¼d. per gallon, both *ex* works in buyers' packages.

Creosote oil.—Substantial quantities are out on offer and prices are unchanged as under: Specification oil, 5d. to 5¼d. per gallon; low gravity, 6d. to 6¼d. per gallon; neutral oil, 5d. to 5¼d. per gallon, all *ex* works in bulk.

Cresylic acid.—The volume of business is very small and quotations are nominal at about the following: Pale, 97/99%, 2s. 10d. to 3s. per gallon; dark, 97/99%, 2s. 8d. to 2s. 10d.; and pale, 99/100%, 3s. 3d. to 4s. per gallon; according to quality, all *ex* works in buyers' packages.

Crude naphtha.—Available supplies are limited and readily command 6d. to 6½d. per gallon *ex* works in bulk, according to quality and district.

Solvent naphtha.—90/160 grade is valued at 1s. 5½d. to 1s. 6½d. per gallon, and 90/190 heavy naphtha is now quoted at 1s. 1d. to 1s. 2d. per gallon.

Motor benzole commands 1s. 4½d. per gallon.

Pyridine.—Supplies are limited and prices are steady at 12s. to 12s. 6d. per gallon for 90/160 grade, and 13s. to 14s. per gallon for 90/140 grade.

Benzole Prices

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole..	0	9½	to	0	10	per gall. at works
Motor „ ..	1	3	„	1	3½	„ „ „
90% „ ..	1	4	„	1	4½	„ „ „
Pure „ ..	1	8	„	1	8½	„ „ „

Contracts Advertised To-Day

Boosters.
Workington Gas Department. [p. 342.]

Exhauster Set.
Belfast Gas Department. [p. 342.]

Meters.
Workington Gas Department. [p. 342.]

Pipes and Specials.
Dewsbury Gas Department. [p. 342.]
Workington Gas Department. [p. 342.]

Purifiers, Pre-Heater.
Workington Gas Department. [p. 342.]

Steel Roof Principals.
Spenborough Council Gas Department. [p. 342.]

Stores.
Dewsbury Gas Department. [p. 342.]

Van Body and Tower Wagon.
Wallasey Gas Department. [p. 342.]

Dividend Announcements

Chester.—Final of 3¼%, making 5¼%, less tax (same).

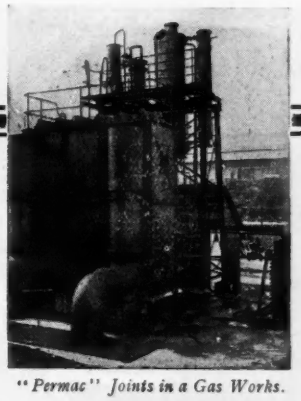
Newcastle-upon-Tyne and Gateshead.—Final of 2¾% on ordinary, making 5⅜%, less tax (same).

Portsmouth and Gosport.—Dividend of 8¼% for the year on consolidated stock (same).

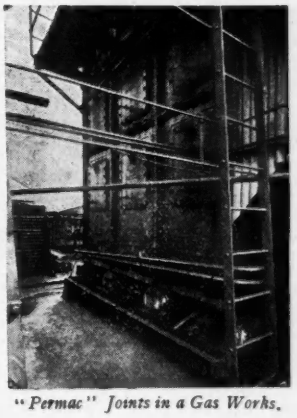
South Metropolitan.—Final of 3% actual, less tax, on ordinary stock, making with the interim dividend of 2½%, 5½% for the year (same).

Watford and St. Albans.—Final of 3½%, making 7% (same) on ordinary.

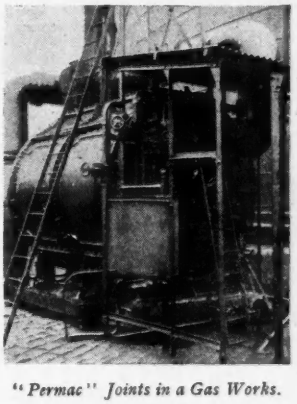
East Surrey.—On the preference and ordinary stock for the half-year ended Dec. 31 at the following rates per annum: 6% on the cumulative preference; 4½% on the redeemable preference; 5½% on the preference "A"; and 6% on the ordinary "B" stock, all less income-tax (same).



"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works.

Permac
METAL-TO-METAL JOINTING MATERIAL

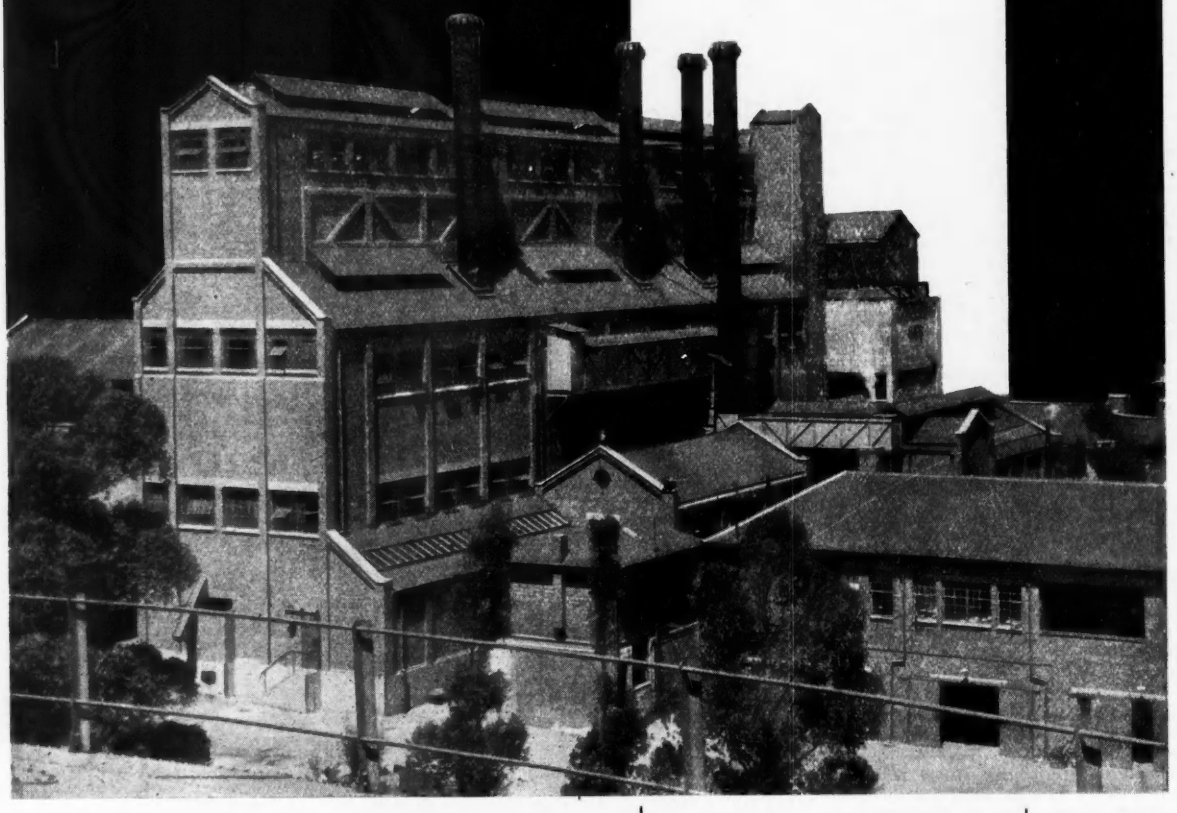
Ever since 1913 "PERMAC," the original Metal-to-Metal Jointing, has been holding up difficult joints like these in important Gas Works and on Coke Oven Plants all over the world. Equally suitable for any joint—steam, water, gas, oil—screw pipe or flange. Send for particulars.

Manufactured only by

Thomas & Bishop LTD.
37, Tabernacle Street, LONDON, E.C.2
Telephone: Clerkenwell 3351 (2 lines)

Glover-West

MODERN VERTICAL RETORT PLANTS



JOHANNESBURG S. A.

Since the complete new Cottesloe Gas Works was built for the Johannesburg Council by the West organisation in 1928, the original 18-retort battery of Glover-West verticals has been trebled. The third unit recently put into service is foremost in the picture. It brings the total retorts to 54 and the total production capacity of this typically modern works to 4½ million cubic feet.

● Carbonizing plants of West design and construction represent to-day's methods of gas manufacture all over the world. The 414 plants built or in progress are distributed over 24 countries.

WEST'S GAS IMPROVEMENT CO. LTD. • MILES PLATTING • MANCHESTER 10

GAS STOCKS AND SHARES

Friday last saw the close of the second week in a three-week Account—a type in which a reactionary tendency is not uncommonly experienced. In addition there were a display of weakness in Wall Street and erratic movements in the French franc.

Markets opened in fairly good style, especially in the gilt-edged and home rail sections, the latter being stimulated by the latest good traffic returns, though the volume of business was limited. Towards the close the disturbing influences brought down prices in many cases to below their former level, only home rails retaining their improvements. Leading industrials lost ground, and oil, gold, and rubber shares weakened. Tea shares were firm, several issues rising 5s. on the week.

The Gas market was comparatively well supported, and in contrast to the past few weeks quite a number of quotations in the Official List was marked up. Among the "ordinaries" to improve it will be seen that Commercial rose a further 2 points to 85-90, making 5 points in the past two weeks. On several occasions during the past year attention has been drawn in this Report to the low price of this stock, and on the present dividend basis there is room for still further improvement. At the time of writing a parcel is on offer at 90 yielding £5 11s. 3d. South Metropolitan ordinary also went ahead again, closing 2 points up at 106½. This Company is distributing a final dividend of 3%, making 5½% for the year (unchanged). The 5% debenture stocks of the Commercial, Croydon, South Suburban, and Wandsworth Companies all improved from 2 to 3 points. Imperial Continental suffered another relapse with a drop of 5 to 130½.

The Gas Light and Coke Company's report and accounts, which are fully dealt with elsewhere in this issue, were published on Friday last. Having regard to all the circumstances, the results cannot be said to be unsatisfactory, and although the dividend was not quite earned, a fact which led to a small reaction in the price of the units, the potential extra revenue from gas during the present year will doubtless enable the Company to provide for its extra coal bill, the heavier cost of which was largely responsible for the drop in the gross profit last year.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 28.	Rise or Fall on Week.
1,767,439	Sept. 6	8	8	Alliance & Dublin Ord. ...	158—163	+1
374,000	Dec. 13	4	4	Do. 4 p.c. Deb. ...	95—100	...
558,890	Aug. 9	7	7	Barnet Ord. 7 p.c.	158—163	...
300,000	Oct. 49	1/9⅜	1/4⅜	Bombay, Ltd.	26/—28/-	...
179,915	Aug.	9½	9½	Bournemouth sliding scale ...	200—205	...
590,407	,,	7	7	Do. 7 p.c. max. ...	158—163	...
493,960	,,	6	6	Do. 6 p.c. Pref. ...	133—138	...
50,000	Dec. 13	3	3	Do. 3 p.c. Deb. ...	78—83	...
262,025	,,	4	4	Do. 4 p.c. Deb. ...	98—103	...
335,000	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...
357,900	Aug. 9	7½	7½	Brighton, &c., 6 p.c. Con. ...	150—155	...
649,955	,,	6½	6½	Do. 5 p.c. Con. ...	133—138	...
205,500	,,	6	6	Do. 6 p.c. 'B' Pref.	127—133	...
855,000	Sept. 20	8	7	British Ord.	140—145	+1
100,000	Dec. 13	7	7	Do. 7 p.c. Pref.	140—145	...
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...
450,000	,,	5	5	Do. 5 p.c. Red. Deb. ...	102—107	...
450,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...
100,000	22 May'33	6	4	Cape Town, Ltd.	1½—2½	...
100,000	6 Nov.'33	4½	4½	Do. 4½ p.c. Pref. ...	1½—3½	...
150,000	Dec. 13	4½	4½	Do. 4½ p.c. Deb. ...	70—75	...
626,860	July 19	6	6	Cardiff Con. Ord.	125—130	...
237,860	Dec. 13	5	5	Do. 5 p.c. Red. Deb.	106—111	...
98,936	Oct. 4	2/-	2/-	Colombo Ord....	1⅝—1⅞	...
24,510	,,	1/4½	1/4½	Do. 7 p.c. Pref.	23/6—25/6	...
739,453	Oct. 4	-/11·48	-/11·48	Colonial Gas Assn. Ltd. Ord.	17/—19/-	...
296,144	,,	1/3·30	1/3·30	Do. 8 p.c. Pref.	22/—24/-	...
1,775,005	Aug. 9	5	5	Commercial Ord.	85—90	+2
620,000	Nov. 29	3	3	Do. 3 p.c. Deb. ...	73—78	...
286,344	Aug. 23	5	5	Do. 5 p.c. Deb. ...	115—120	+2
807,560	Aug. 9	7	7	Croydon sliding scale... ...	140—145	...
644,590	,,	5	5	Do max. div.	110—113	...
620,385	Dec. 13	5	5	Do. 5 p.c. Deb.	115—120	+3
239,000	Aug. 9	5	5	East Hull Ord. 5 p.c....	98—103	...
185,355	Aug. 9	6	6	East Surrey Ord. 5 p.c. ...	120—125	...
176,211	Dec. 13	5	5	Do. 5 p.c. Deb. ...	112—117	...
250,000	Nov. 15	7	4	Gas Consolidation Ord. ...	19/6—21/6	...
250,000	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	18/6—20/6	...
19,255,284	Aug. 9	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	24/—25/-a	-/3
2,600,000	,,	3½	3½	Do. 3½ p.c. max. ...	84—87	+1
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref.	100—103	...
2,993,000	Jan. 17	...	3⅜	Do. 3⅜ p.c. Red. Pref.	101—103*	...
8,602,497	Nov. 29	3	3	Do. 3 p.c. Con. Deb.	80—83	+½
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb.	112—115	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb.	110—113	...
700,000	Sept. 6	3½	3½	Do. 3½ p.c. Red. Deb.	98—101	...
270,466	Aug. 23	6	6	Harrogate New Cons. ...	115—120	...
157,500	April 5	1/2⅜	1/2⅜	Hong Kong and China Ord	1—1¼	...
213,200	Aug. 9	6	6	Hornsey Con. 3½ p.c. ...	118—123	...
5,600,000	Nov. 1	12	8	Imperial Continental Cap. ...	128—133	−5
223,130	Jan. 17	3½	3½	Do. 3½ p.c. Red. Deb. ...	88—93*	...
285,242	Aug. 9	8½	8½	Lea Bridge 5 p.c. Ord. ...	170—175	...
11,751	Aug. 23	10	8	Maidstone 5 p.c. Cap.... ...	180—190	...
63,480	Dec. 13	3	3	Do. 3 p.c. Deb. ...	70—75	...
75,000	Nov. 29	†10	†10	Malta & Mediterranean ...	145—155	...
				Metropolitan (of Melbourne)		...
392,000	Oct. 1	5½	5½	5½ p.c. Red. Deb.	100—103	...
231,978	Aug. 23	5	5	M.S. Utility 'C' Cons. ...	101—106	...
968,657	,,	4	4	Do. 4 p.c. Cons. Pref.	96—101	...

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 28.	Rise or Fall on Week.
360,075	Dec. 13	4	4	M.S. Utility 4 p.c. Deb. ...	97—102	...
148,955	,,	5	5	Do. 5 p.c. Deb. ...	113—118	+1
675,000	Nov. 15	†9	†6	Montevideo, Ltd.	85—90	...
250,000	Aug. 9	7½	7½	North Middlesex 6 p.c. Con.	147—152	...
396,160	Aug. 9	5	5	Northampton 5 p.c. max. ...	110—115	...
300,000	Oct. 18	†7	†9	Oriental, Ltd.	153—158	...
468,537	Dec. 13	8	8	Plymouth & Stonehouse 5 p.c.	154—159	...
621,667	Aug. 9	8½	8½	Portsmouth & Gosport Cons.	164—169	...
241,446	,,	5	5	Do. 5 p.c. max. ...	104—109	...
73,350	,,	5	5	Do. 5 p.c. Pref. ...	110—115	...
247,966	Dec. 13	4	4	Primitiva 4 p.c. Cons. Deb. ...	98—103	...
625,959	Jan. 17	4	4	Do. 4 p.c. Red. Deb. ...	95—100*	...
15,000	Sept. 6	6	6	San Paulo 6 p.c. Cum. Pref. ...	9—9½	...
441,275	Sept. 20	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	21/6—23/6	...
460,810	,,	-/10⅝	-/10⅝	,, ,, 4½ p.c. Cum. Pref.	19/6—21/6	...
133,201	Aug. 23	5	8½	Shrewsbury 5 p.c. Ord. ...	130—135	...
9,000	June 7	4	4	South African Ord.	3⅜—4⅜	...
1,371,752	Sept. 6	1/2⅜	1/2⅜	South East'n Gas Cn. Ld. Ord.	23/—25/-	...
871,636	,,	-/10⅝	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	20/—22/-	...
498,818	,,	4	4	Do. 4 p.c. Cum. Pref. ...	18/—20/-	...
450,000	Aug. 9	4	4	Do. 4 p.c. Deb.	99—102	...
150,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	96—99	...
6,709,895	Aug. 9	6	5	South Met. Ord.	105—108	+2
1,135,812	,	6	6	Do. 6 p.c. Irred. Pf. ...	131—136	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pf. ...	98—101	...
1,895,445	Dec. 13	3	3	Do. 3 p.c. Deb. ...	74—79	...
1,000,000	Jan. 17	5	5	Do. 5 p.c. Red. Deb....	109—112*	...
1,543,795	Aug. 9	6	6	South Suburban Ord. 5 p.c. ...	120—125	...
512,825	,,	5	5	Do. 5 p.c. Pref....	110—115	...
500,000	,,	4	4	Do. 4 p.c. Pref....	95—100	...
250,000	,,	...	§18/9	Do. 3½ p.c. Red. Pref.	98—101	...
888,587	Dec. 13	5	5	Do. 5 p.c. Deb....	115—120	+2
250,000	,,	4	4	Do. 4 p.c. Deb....	97—100	...
200,000	Sept. 20	...	3½	Do. 3½ p.c. Red. Deb.	94—99	...
427,859	Nov. 1	1/2⅝	9⅜	S. Western Gas & Water Ord.	18/6—20/6	...
160,523	,,	-/10½	-/10½	Do. 4½ p.c. Red. Cum. Pf.	19/6—21/6	...
110,000	Dec. 13	4	4	Do. 4 p.c. Red. Deb. ...	97—102	...
750,541	Aug. 9	5½	5	Southampton Ord. 5 p.c. ...	111—116	...
148,836	Dec. 13	4	4	Do. 4 p.c. Deb.	96—101	...
350,000	Aug. 23	5½	5½	Swansea 5½ p.c. Red. Pref. ...	110—115	...
94,000	Jan. 3	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100*	...
1,076,490	Aug. 9	6½	6½	Tottenham and District Ord.	131—136	...
409,835	,,	5½	5½	Do. 5½ p.c. Pref....	121—126	...
62,235	,,	5	5	Do. 5 p.c. Pref....	109—114	...
371,850	Dec. 13	4	4	Do. 4 p.c. Deb....	97—102	...
85,701	July 19	‡6	6	Tuscan 6 p.c. Red. Deb. ...	96—101	...
888,629	Oct. 4	6	4	U. Kingdom Gas Cor. Ord....	19/—21/-	...
937,743	Nov. 15	4½	4½	Do. 4½ p.c. 1st Cum. Pref.	20/—22/-	...
500,000	,,	...	-/1·15	Do. 4 p.c. 1st Red. Cum. Pf.	19/—21/-	...
745,263	Dec. 13	4½	4½	Do. 4½ p.c. 2nd Non-Cum.Pf.	16/6—18/6	...
1,000,000	Sept. 20	3½	3½	Do. 3½ p.c. Red. Deb. ...	96—99	...
373,939	Aug. 9	7	7	Uxbridge, &c., 5 p.c.... ...	138—143	...
133,010	,,	5	5	Do. 5 p.c. Pref. ...	109—114	...
1,371,138	Aug. 9	7	7	Wandsworth Consolidated ...	140—145	...
2,525,768	,,	4	4	Do. 4 p.c. Pref. ...	99—102	...
1,343,964	Dec. 13	5	5	Do. 5 p.c. Deb. ...	115—120	+2
383,745	,,	4	4	Do. 4 p.c. Deb. ...	97—102	...
558,342	Aug. 9	7	7	Watford and St. Albans Ord.	140—145	...
200,000	,,	5	5	Do. 5 p.c. Pref. ...	109—114	...
200,000	,,	5½	5½	Do. 5½ p.c. Pref. ...	121—126	...
200,000	Nov. 29	4	4	Do. 4 p.c. Red. Deb.	95—100	...
100,000	,,	3½	3½	Do. 3½ p.c. Red. Deb.	94—99	...

a.—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax ‡ For year. Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Cont.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 28.	Rise or Fall on Week.
202,152	Sept. 6	25/-*b*	5	Ascot Ord.	100—105	...
128,182	Dec. 13	5	5	Do. 5 p.c. Pref.	108—113	...
573,156	Nov. 15	5	5	Assd. Gas and Water Ord. ...	19/—21/-	...
167,506	,,	...	-/4*c*	Do. 4 p.c. Red. Cum. Pref.	19/—20/-	...
253,118	,,	...	4	Do. 4 p.c. Irred. Pref. ...	17/—19/-	-1/-
500,000	,,	4⅛	4⅛	Do. 4⅛ p.c. Red. Cum. Pref.	19/—21/-	...
500,000	Sept. 6	3⅛	3⅛	Do. 3⅛ p.c. Red. Deb. ...	95—100	...
31,035	Aug. 23	...	-/4⅛	Associated Utilities 4 p.c. Pref.	16/6—18/6	...
100,000	Dec. 13	...	3⅛	Do. 3⅛ p.c. Red. Deb....	95—100	...
17,000	Aug. 23	8	8	Bognor Orig. Ord. 'A' ...	160—170	...
62,210	,,	8	8	Do. New Addl. 'A' ...	160—170	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	141—146	...
37,440	Aug. 9	10	10	Cam. Univ. & Town10 p.c. max.	193—203	...
125,970	,,	7	7	Do. 7 p.c. max.	135—140	...
39,025	,,	5	5	Do. 5 p.c. max.	98—103	...
65,000	Aug. 9	8⅛	7⅛	Eastbourne 'A' 5 p.c. ...	158—163	...
198,000	,,	7	6	Do. 'B' 3½ p.c.	128—133	...
112,312	,,	5	5	Do. 5 p.c. Pref.	108—113	...
130,000	Dec. 13	5	5	Do. 5 p.c. Deb.	113—118	...
24,000	Aug. 23	8½	8½	Great Yarmouth 8½ p.c. max.	44—49	...
59,400	,,	7½	7½	Do. 7½ p.c. max.	34—39	...
51,160	Dec. 13	5½	5½	Do. 5½ p.c. Deb.	120—125	...
152,600	Sept. 6	9	8	Guildford Cons.	170—175	...
54,055	,,	5	5	Do. 5 p.c. Pref.	110—115	...
68,250	Dec. 13	5	5	Do. 5 p.c. Deb.	112—117	...
156,600	Aug. 23	7½	7½	Hampton Court Cons. ...	145—155	...
73,620	Sept. 6	8½	8½	Luton Cons. 'A'	163—168	...
107,960	Sept. 20	5½	4	Mid Kent Ord.	8⅛—9⅛	...
230,940	Aug. 9	10	10	Oxford & District Ord. ...	205—210	...
47,112	,,	5	5	Do. 5 p.c. Pref.	108—113	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	110—115	...
126,193	Nov. 15	7½	7½	Peterborough Ord.	158—163	...
64,990	Sept. 6	7½	6½	Redditch Ord....	125—135	...
166,850	Aug. 9	8	8	Romford Ord....	155—160	...
60,000	,,	4	4	Do. 4 p.c. Pref.	97—100	...
44,000	Sept. 20	5	5	Do. 5 p.c. Deb.	113—118	...
25,570	Aug. 9	5½	5½	Rugby 5½ p.c. Pref.	125—130	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	106—111	...
42,750	Dec. 13	5½	5½	Do. 5½ p.c. Deb.	120—125	...
10,950	Aug. 23	8	8	Ryde Ord.	158—163	...
270,086	Sept. 6	7	7	Slough Ord.	133—138	...
21,000	Dec. 13	5	5	Do. 5 p.c. Deb.	110—115	...
28,872	Nov. 1	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	19/—21/-	...
28,866	Sept. 6	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	18/6—20/6	...
137,730	Aug. 9	7	7	Southgate & Dist. 7 p.c. max.	140—145	...
62,500	,,	5	5	Do. 5 p.c. Pref.	110—115	...
117,228	Aug. 23	5	5	Swindon Cons.	106—111	...
60,425	Dec. 13	5	5	Do. 5 p.c. Deb.	110—115	...
64,380	Dec. 13	5	5	Torquay and Paignton 5 p.c. Pf.	108—113	...
33,858	Nov. 15	...	-/2·70*c*	United Kingdom Gas Corpn. 4½ p.c. 1st Cum. Pref. ...	20/—22/-	...
130,000	Aug. 9	8	5	Wakefield Ord.	120—125	...
81,650	,,	5	5	Do. 5 p.c. max.	103—108	...
82,000	Aug. 9	6	6	Weymouth Ord.	103—108	...
98,384	Aug. 9	6	6	Wolverhampton 6 p.c. Pref....	120—125	...
160,000	Dec. 13	5½	5½	Do. 5½ p.c. Rd. Db.	107—112	...
90,000	Dec. 13	5	5	York 5 p.c. Red. Deb.... ...	104—109	...
133,640	July 19	6½	6½	Yorktown (Cam.) 5 p.c. Cons.	128—133	...
120,000	,,	5	5	Do. 5 p.c. Pref.	108—113	...
35,000	Dec. 13	5½	5½	Do. 5½ p.c. Deb.	121—126	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, Jan. 28.	Rise or Fall on Week.
347,756	July 19	6	5	Bath Cons.	120—122	...
1,667,250	July 19	5	5	Bristol, 5 p.c. max.	117—119	+
120,420	Dec. 13	4	4	Do. 1st 4 p.c. Deb. ...	100—102	...
217,870	,,	4	4	Do. 2nd 4 p.c. Deb. ...	100—102	...
328,790	,,	5	5	Do. 5 p.c. Deb.	119—122	...
274,000	July 19	5	5	Newport (Mon.) 5 p.c. max....	100—102	...
13,200	Sept. 6	8	7	Pontyp'l Gas & W. 10 p.c. 'A'	13—14	...
13,600	,,	6	5	Do. 7 p.c. 'B'	11⅞—12⅛	...
40,000	,,	6	5	Do. 7 p.c. 'C'	11⅞—12⅛	...
140,778	Aug. 9	5	5	Weston-super-Mare Cons. ...	110—112	...
64,338	Jan. 3	4	4	Do. 4 p.c. Deb.	94½—96½	...
33,340	,,	7⅛	7⅛	Do. 7⅛ p.c. Deb.	154—157	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, Jan. 28.	Rise or Fall on Week.
157,150	Aug. 9	6½	5	Chester 5 p.c. Ord.	106—110	...
92,500	Dec. 13	4	4	Do. 4 p.c. Pref.	96—100	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	88—91	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	97—101	...
2,167,410	Aug. 23	6	6	Liverpool 5 p.c. Ord.... ...	125½—127¾	...
245,500	Dec. 13	5	5	Do. 5 p.c. Red. Pref. ...	99—104	...
306,083	July 1	4	4	Do. 4 p.c. Deb. ...	102—104	...
106,280	Aug. 9	10	10	Preston 'A' 10 p.c.	206—216	...
188,219	,,	7	7	Do. 'B' 7 p.c.	147—157	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, Jan. 28.	Rise or Fall on Week.
122,577	Aug. 9	8	8	Blyth 5 p.c. Ord.	165—166	...
732,000	Aug. 9	5	5	Hartlepool G. & W. Cn. & New	112—114	...
2,061,315	Aug. 9	5⅛	5	Newcastle & Gateshead Con.	23/6—24/-*a*	...
682,856	,,	4	4	Do. 4 p.c. Pref. ...	98—100	...
776,706	Jan. 3	3½	3½	Do. 3½ p.c. Deb. ...	89½—90½*	...
277,285	Nov. 1	5	5	Do. 5 p.c. Deb. '43...	103—105	...
332,351	Aug. 23	6	6	Sunderland 6 p.c. max. ...	140—142	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, Jan. 28.	Rise or Fall on Week.
542,270	Aug. 9	9	6	Derby Con.	135—145	...
55,000	Dec. 13	4	4	Do. 4 p.c. Deb. ...	100—105	...
20,000	Dec. 13	5	5	Long Eaton 5 p.c. Pref. ...	10—12	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, Jan. 28.	Rise or Fall on Week.
10,000	Sept. 20	10	10	Great Grimsby 'A' Ord. ...	210—220	...
6,500	,,	10	10	Do. 'B' Ord. ...	210—220	...
79,000	,,	10	10	Do. 'C' Ord. ...	205—210	...
1,806,339	Aug. 23	6	6⅛	Sheffield Cons.	144—148	...
95,000	Jan. 3	4	4	Do. 4 p.c. Deb.	100—103	...

a The quotation is per £1 of Stock. Actual for Quarter. *c* Actual. * Ex div.

PUBLISHERS' NOTICE

TERMS OF SUBSCRIPTION

United Kingdom & Ireland : Advance Rate, 35/- per annum; 18/- per half year. Credit Rate : 40/- per annum; 21/- per half year. Dominions & Colonies & United States: 35/- per annum, in advance. Other countries in the Postal Union, 40/- per annum, in advance.

A copy of the "G.J." Calendar and Directory is presented to continuous subscribers.

CLASSIFIED ADVERTISEMENTS

Situations Wanted, 6d. a line (minimum 3/-, about 36 words). Situations Vacant, Plant for Sale and Wanted, Contracts, Public Notices, Educational, &c., 9d, a line (minimum 4/6). Financial Notices, 1/- per line. Box Number, 6d. extra.

WALTER KING, LTD.,

Telephone : Central 2236-7-8.

11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams : Gasking, Fleet, London.